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U. S. DEPARTMENT OF LABOR
CHILDREN'S BUREAU

JULIA C. LATHROP, Chief

INFANT MORTALITY

RESULTS OF A FIELD STUDY IN MANCHESTER, N. H.
BASED ON BIRTHS IN ONE YEAR

By

BEATRICE SHEETS DUNCAN and EMMA DUKE

INFANT MORTALITY SERIES No. 6
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LETTER OF TRANSMITTAL.

U. S. DEPARTMENT OF LABOR,
CHILDREN'S BUREAU,
Washington, November 4, 1916.

SIR: I transmit herewith a study of infant mortality in the city of Manchester, N. H., for one year, being the third item in the field inquiry begun by the study of infant mortality in Johnstown, Pa.

Manchester was selected because of its high infant mortality rate, according to the United States census figures (1910), because it is within the birth-registration area, and because certain of its industrial characteristics are in marked contrast with those of Johnstown.

The field work was directed and the preparation of the statistical material was supervised by Miss Emma Duke, now in charge of the bureau's statistical division. The text was prepared principally by Mrs. Beatrice Sheets Duncan, who, however, resigned from the bureau before the completion of the report. The final revision was made by Miss Duke and Mr. Howard C. Jenness. A supplementary field study of father's earnings was in charge of Miss Marie Kasten.

An unusually large number of field agents and statistical clerks shared in the work of this report because it was made during a transition period—while the civil-service examinations for the enlarged staff were pending—and it was necessary to secure a considerable number of temporary assistants. I regret that it is therefore impracticable to mention all those in the office and in the field who have assisted in this study.

Respectfully submitted.

JULIA C. LATHROP, *Chief.*

Hon. WILLIAM B. WILSON,
Secretary of Labor.

INFANT MORTALITY, MANCHESTER, N. H.

INTRODUCTION.

Manchester, N. H., was the second city selected by the Children's Bureau for a field inquiry into infant mortality in its series of community studies upon this subject. The first study was made in Johnstown, Pa., a steel-mill city containing a large foreign population. A second report upon infant mortality, however, has been published by the bureau, namely, that for Montclair, N. J., a suburban residence community, where the investigation itself was conducted by the city authorities and the results presented by them to the Children's Bureau for analysis.

Manchester was chosen for several reasons: It had an unusually high infant mortality rate, it was within the registration area for births and deaths so that records for those were available, and it presented conditions which usually are associated with high infant mortality—namely, a large foreign population and a considerable proportion of industrially employed women.

Because of incomplete registration of births and deaths infant mortality rates are not available for all cities in the United States, but only for those cities in which such registration is considered to be 90 per cent complete. Of such cities, according to the table, only two, Holyoke and Lowell, have higher infant mortality rates than Manchester, and the high rate in Holyoke is perhaps due in part to the presence there of a large infant asylum which receives infants born in other cities.

For the registration States,¹ which in 1910 comprised 58.3 per cent of the population and 33.6 per cent of the land area of the United States, the infant mortality rate for 1910 was 124, as computed by the Bureau of the Census. In other words, for every eight births there was one infant death.

Behind a general rate, however, are variations not only among different communities but, more markedly, among different groups within the same community; and to trace, if possible, these variations between and within communities and to learn in detail the conditions under which babies live and die is the purpose of the series of studies to which the present report is a contribution.

¹ The registration States are those in which the registration of deaths is considered by the Bureau of the Census to be at least 90 per cent complete.

The term infant mortality rate as ordinarily used means the number of deaths of infants (i. e., babies under 1 year of age) per 1,000 live births in the same area during the same year. In Manchester in 1910, according to statistics published by the Federal Bureau of the Census, this rate was 193. How it compares with rates in other cities of at least 50,000 population in 1910 is shown in the following table:¹

Infant mortality rates for registration cities having a population of at least 50,000 in 1910.

City.	Infant mortality rate. ¹	City.	Infant mortality rate. ¹
Connecticut:		New York, N. Y.	125
Bridgeport.....	123	Bronx Borough.....	96
Hartford.....	119	Brooklyn Borough.....	117
New Haven.....	108	Manhattan Borough.....	136
Waterbury.....	149	Queens Borough.....	122
Manchester, N. H.	193	Richmond Borough.....	138
Massachusetts:		Pennsylvania:	
Boston.....	126	Allentown.....	144
Brockton.....	99	Altoona.....	119
Cambridge.....	119	Erie.....	115
Fall River.....	186	Harrisburg.....	129
Holyoke.....	213	Johnstown.....	165
Lawrence.....	167	Philadelphia.....	138
Lowell.....	231	Pittsburgh.....	150
Lynn.....	97	Reading.....	142
New Bedford.....	177	Scranton.....	148
Somerville.....	101	Wilkes-Barre.....	146
Springfield.....	124	Portland, Me.	144
Worcester.....	137	Rhode Island:	
Michigan:		Pawtucket.....	(2)
Detroit.....	179	Providence.....	(2)
Grand Rapids.....	122	Washington, D. C.	152
Saginaw.....	145		

¹ Based on provisional figure for births.

* Returns of births not received from State board of health in time for inclusion.

METHOD AND PLAN OF STUDY.

The infant mortality rates for Manchester and other cities shown in the foregoing table are computed from the births and deaths registered during a given calendar year. Obviously the deaths in part were of babies born during the previous year and the rate can not be used as an exact measure of the deaths of those born during a given year. To avoid this inaccuracy and to obtain a precise rate it would be necessary to follow through their first year of life all babies born during the year and to note the deaths occurring among them within that period. Such a method requires not only perfect birth registration but the means of locating the baby (or its family) 12 months after birth, and therefore for most communities is quite impracticable; but the present study has been limited to those babies to whom this method can be applied. It is, therefore, the one employed.

Scope.—The work of investigation was begun in Manchester in the fall of 1914, when all the babies born within the selected period might have completed 12 months of life. The study, as stated, was confined to registered babies whose names and addresses were obtained

¹ Derived from table on page 18 of Bulletin 169, Mortality Statistics, 1910, Bureau of the Census, Washington, 1912.

from the birth certificates on file at the city hall. So far as possible all their mothers were interviewed and information secured regarding the care of the baby, the character of the home, the economic status of the family, etc., and the information thus secured was recorded upon the schedules and furnishes the basis for analyzing the factors contributing toward the high infant mortality rate in Manchester. All such information was secured whether the babies lived or died, the purpose being to study the conditions existing the first year after birth, and to note under what circumstances babies survive or fail to survive.

Cooperation.—Before the work of interviewing the mothers was begun the nature and purpose of the investigation was explained fully through the newspapers and by the clergy in order that the interest and cooperation of the public and particularly of the mothers might be secured. From the beginning every courtesy was extended to the agents by the local city officials in giving access to city records and support to the investigation. The mothers were found ready and willing to give the information desired as soon as they understood the reason for it. Evidence of the cordial response which they made to this inquiry is furnished by the fact that in six cases only was the information refused.

Infants included and excluded.—The investigation was limited to the live births and stillbirths registered in Manchester between November 1, 1912, and October 31, 1913. These numbered 2,152, but for the reasons noted in the following summary 604 of the births during the selected year were excluded from the study. Of these, 95 were excluded because they were not registered and 470 because the babies could not be found.

Nationality of mother.	Births during selected year.								
	Total.	In-cluded in study.	Excluded from study and reasons for exclusion.						
			Total.	Un-regis-tered ¹	Not found. ²	Mother dead and data in-complete.	Informa-tion refused.	Miscar-riage. ³	Illegiti-mate. ⁴
All mothers.....	2, 247	1, 643	604	95	470	15	6	7	11
Native unknown.....	2	2	2	2	.....	.....	.....	.....	.....
Native.....	724	548	176	27	132	4	3	3	7
Foreign-born.....	1, 521	1, 095	426	66	338	11	3	4	4
Canadian, French.....	808	610	198	28	160	7	.....	3	.....
Canadian, except French.....	41	27	14	.....	13	1	.....	.....	.....
Polish.....	277	170	107	21	81	2	1	1	1
English, Irish, Scotch.....	144	115	29	6	18	1	2	.....	2
Greek and Syrian.....	113	72	41	9	32	.....	.....	.....	.....
German.....	31	30	1	.....	1	.....	.....	.....	.....
Jewish.....	25	24	1	.....	1	.....	.....	.....	.....
Ruthenian and Lithuanian.....	30	22	8	2	5	.....	.....	.....	1
All other and no report.....	52	25	27	.....	27	.....	.....	.....	.....

¹ Including 9 illegitimate births.

² Including 24 illegitimate births.

³ Study confined to issues of pregnancy resulting from 7 or more months' gestation.

⁴ Mother visited; results discussed in illegitimacy section on page 108.

In 1,643 instances complete schedules were secured and used as the basis of this study. Of these, 79 were for stillborn infants. Among the 1,564 live-born infants occurred 258 infant deaths, a mortality rate of 165. This rate is not offered as an accurate one for the city nor as one to be used in comparison with the rates for other cities, but rather as a rate accurate for the sample group of babies selected for detailed study.

The precise infant mortality rate for the city as a whole can not be computed, because the exact number of births and of deaths during the 12 months is not known. We know that in addition to the 509 excluded cases of babies whose births were registered, other babies were born in the selected period whose births were not registered. Agents found 95 such babies chiefly through the death certificates, but no attempt was made to find all surviving unregistered births. Hence to compute a rate for unregistered births, learned of principally through death certificates, is obviously unsound; in fact, such a rate would be over 800.

Practically all infant deaths in Manchester were recorded, but the number of the excluded babies who may have died outside the city is unknown; therefore a rate based upon those who were born in Manchester and moved away in their first year would be too low.

By using all available data (that is, not only the births included in the study but also the 509 registered and the 95 unregistered births excluded from the study), incomplete as they are, for computing a rate, we find an infant mortality rate of 188.7. This rate is undoubtedly too high, for, as we have seen, no canvass was made to find all babies whose births were not registered. If all babies had been located and included in the study the true rate for the city would lie in all probability somewhere between the two rates, 165 and 188.7.

TABLE 2.

	Births during selected year and infant deaths.					
	Total births.	Live births.			Stillbirths and miscarriages. ¹	
		Total.	Infant deaths.		Number.	Per cent.
			Number.	Infant mortality rate.		
Total.....	2,247	2,114	399	188.7	133	5.9
Included in detailed study, registered.....	1,643	1,564	258	165.0	79	4.8
Excluded from detailed study.....	604	550	141	256.4	54	8.9
Registered.....	509	471	77	163.5	38	7.5
Unregistered.....	95	79	64	810.1	16	16.8

¹ Dead issues of less than 7 months' gestation were not included in the detailed study.

A classification by mother's nationality of registered births that were excluded from tabulation shows the number of such births to foreign-born and to native mothers.

Nationality of mother.	Registered births during selected year and infant deaths excluded from detailed study.				
	Total births.	Live births.			Still-births and miscarriages.
		Total.	Infant deaths.		
			Number.	Infant mortality rate. ¹	
All mothers.....	509	471	77	163.5	38
Native.....	149	135	21	155.6	14
Foreign-born.....	360	336	56	166.7	24
Canadian, French.....	170	155	29	187.1	15
Canadian, except French.....	14	13	1	.....	1
Polish.....	86	83	13	.....	3
English, Irish, Scotch.....	23	22	7	.....	1
Greek and Syrian.....	32	30	5	.....	2
German.....	1	1	.....	.....	.....
Jewish.....	1	1	.....	.....	.....
Ruthenian and Lithuanian.....	6	6	.....	.....	.....
All other.....	27	25	1	.....	2

¹ Not shown where base is less than 100.

Verification of father's earnings.—Information concerning father's earnings was originally obtained from the mother, but when the schedules had all been completed and turned in to the office a question arose as to whether or not mothers generally are able to give reasonably accurate statements concerning their husbands' earnings. It was decided, therefore, to check or verify the mothers' answers and, accordingly, eight months after the original data were secured, agents were sent to Manchester for this purpose.

Employers gave generous assistance in this work, and the agents of the bureau had free access to the pay rolls. Because of similarity of names, identification was sometimes difficult; and on account of shifts from one job to another in the same establishment, or from one establishment to another, it was not always possible to secure from pay rolls the earnings of a given man for the entire year.

When the pay-roll record was not complete for the entire year, the agents supplemented the information thus secured by interviews with fathers. Sometimes the fathers found it difficult to remember the earnings for a definite year, namely, that which followed the birth of the baby whose history was being studied, particularly when that was two or more years prior to the time of the interview.

In view of these chances of error, each record secured by the verifiers was carefully studied in connection with the original returns, and that which bore evidence of greater accuracy was accepted.

Where the evidence seemed to afford no basis for choice, preference was given the verifiers' returns.

Averaging the results, it was unexpectedly found that on the whole the complete statements secured from pay rolls and in interviews with employers and fathers were lower than those previously obtained from mothers. As a result of the test it was decided that the deviations were unimportant, and confidence in the mothers' statements of earnings was strengthened.

When infant mortality rates were computed according to father's earnings on the bases of the original, the revised, and the accepted figures, there was found to be little difference in trend in the three sets of figures. The following table and the diagram on the next page indicate the amount of this variation:

TABLE 4. Father's earnings.	Infant mortality rates based upon—		
	Accepted figures.	Original figures.	Revised figures.
Under \$494.....	261.1	241.0	262.4
\$494 to \$571.....	172.2	194.9	145.7
\$572 to \$675.....	186.3	196.2	191.7
\$676 to \$883.....	151.1	158.9	145.7
\$884 to \$1,091.....	143.9	152.5	146.2
\$1,092 and over.....	58.8	94.9	53.2

It will be noticed that the limits of the earnings groups of the diagram differ radically from those of the tables in the body of this report. The limits in the diagram were those originally chosen; the change in this report was the result of a deliberate attempt to secure greater accuracy in results, because a close examination of the individual reports disclosed a marked tendency to concentration of earnings on the even hundreds and on those sums which were multiples of a certain weekly wage. Obviously, of those reporting round numbers, or sums that were multiples of 52, some probably earned more or less than those amounts. Many reported earning a definite weekly wage for the whole year, when in many instances records showed that they had earned less on account of unemployment or more because they had supplemented these earnings by extra work.

The limits of the earnings groups were changed, therefore, so that as far as possible those points of concentration might fall well within the various groups rather than near the upper or lower limit of any group. With the limits of a group fixed at \$550 to \$649, a father reported as earning \$600 who may have earned \$50 more or less would fall still within the proper group; or a father earning \$12 per week who might have suffered six weeks of idleness would be correctly classified so far as the earnings group was concerned.

EXPLANATION OF TERMS.

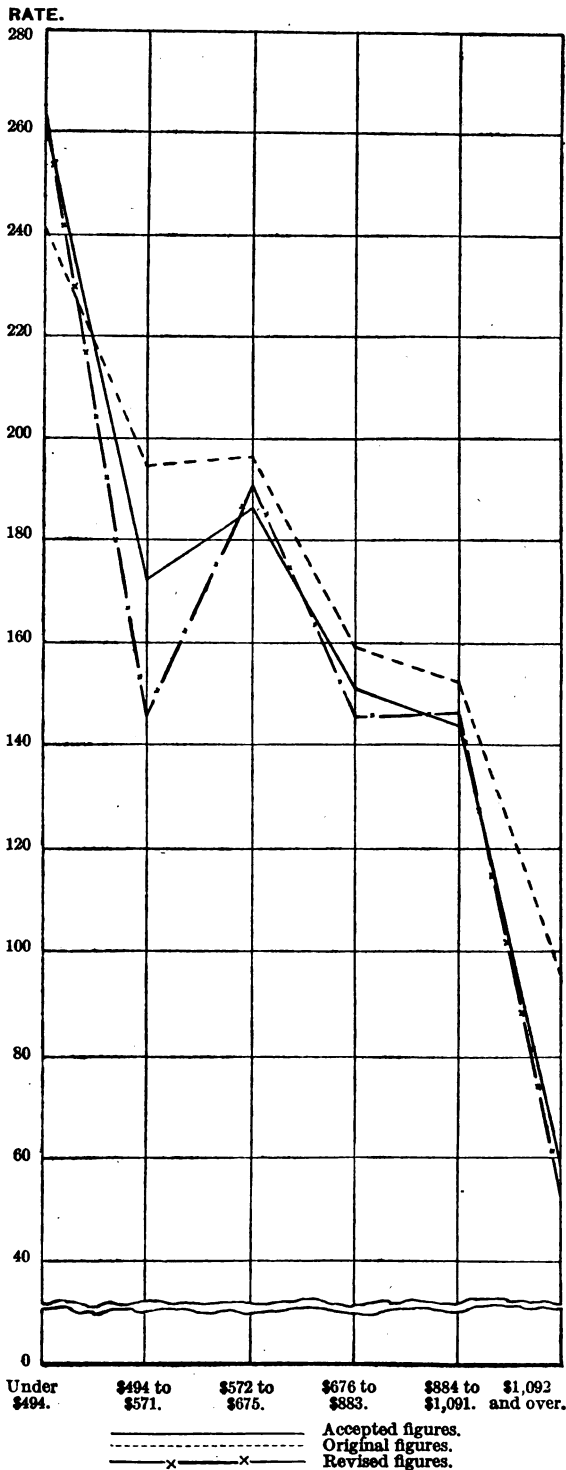
Lack of uniformity in the definitions of such terms as infant, birth, live birth, stillbirth, miscarriage, etc., makes it essential that the meanings assigned these words in this report be explained.

There are no standard definitions for these terms which are uniformly used by medical or legal authorities or vital statisticians and given the same meaning by the general public in various localities. It is generally understood that a child is born dead when it shows no signs of life at birth, but there have been various legal decisions as to what physiological function or functions are to be regarded as signs of life.

In this report the statements of the attending physician on these points as well as upon all medical matters are accepted, and any child recorded as live-born or dead-born by the attending physician has been reported accordingly.

Stillbirth has been applied to all dead-

DIAGRAM 1.—INFANT MORTALITY RATES BY FATHER'S EARNINGS, DERIVED FROM ACCEPTED FIGURES, ORIGINAL FIGURES, AND REVISED FIGURES.



born issues of pregnancy which resulted from seven or more calendar months' gestation; and the term miscarriage to all dead-born issues which have resulted from less than seven calendar months' gestation.

The following are brief explanations of the meanings assigned to some of the expressions used in the text and tables of this report:

Selected year. Year ended October 31, 1913.

Infant. Child under 1 year of age.

Live birth. Infant reported by attending physician as born alive.

Stillbirth. Product of pregnancy expelled after seven or more months' gestation and reported by attending physician as born dead.

Total births. Sum of live births and stillbirths. Miscarriages are excluded.

Miscarriage. Product of pregnancy expelled during first seven months of pregnancy and reported by attending physician as born dead.

Infant death. Death of an infant under 1 year of age.

Infant mortality rate. The number of infant deaths per 1,000 live births during selected year.

All pregnancies. Miscarriages are excluded unless the contrary is indicated by a note.

Maternal records. Statistics on maternal records are based upon complete pregnancy records furnished by married mothers. Whenever the mother had borne children before her marriage, or whenever she had not been able to state positively the age at death of her various children, or the information was in any way incomplete, her record was not included.

Ward of residence. The ward in which live-born infants spent the greater part of their life and in which stillborn infants' mothers spent the greater part of their pregnancy. This was not necessarily the ward in which the birth or death occurred.

Housing. Information as to congestion, house defects, rent, etc., was secured for the house in which the baby spent the greater part of the first year of its life.

Earnings and income. Reports were secured of the earnings and income of the family only for the year following the birth of the infant even in the case of stillborn children, and hence earnings invariably relate to that year.

Occupation of father. The occupation reported for the father is the principal one in which he was engaged in the year following the birth of the infant during the selected year.

Occupation of mother. Occupation of mother was ascertained for the year preceding and the year following the birth of the infant during the selected year.

GENERAL INDUSTRIAL CONDITIONS.

Industries.—The dominant industry of Manchester is the manufacture of textiles, particularly cotton. This industry at present employs more than three times as many people as any other and has played an important part in the city's growth and development from its very early history. As far back as 1809 cotton manufacture was started here in what was then the little village of Derryfield. The Amoskeag Falls at this point of the Merrimack River furnish the abundant water power which has been largely responsible for the development of Manchester into a textile city. In 1794 the potential value of the falls was recognized by Judge Samuel Blodgett, who undertook the project of building a dam and a canal. He predicted that the village of Derryfield some day would become "the Manchester of America,"¹ and in 1810 in honor of his memory the name was changed to Manchester.

The development of the cotton textile industry was slow until 1825, when the enterprise begun in 1809 was taken over by a new company, under whose management the business prospered. Since that period the growth of the industry has been steady. In 1831 a final incorporation under a new management took place, and the company formed then has continued up to the present time.

According to the Federal census of 1910 the total number of persons 10 years of age and over gainfully employed in Manchester was 35,000, of whom 22,743 were male and 12,257 female. There were 25,131 persons engaged in manufacturing and mechanical industries, and of these 9,126 were females.

At present two establishments in Manchester are engaged in cotton manufacture. One of these produces the coarser cotton goods—ducks, sheeting, etc. The other, in addition to the heavy and coarser products, manufactures cotton dress goods, such as gingham and prints, as well as some worsted goods. These two establishments are reported by the employers as having approximately 18,800 employees, of whom 15,500 are in one establishment. The number of women employed in the manufacture of textiles is about 8,600.

The manufacture of shoes is next in importance to that of textiles. The six largest establishments employ over 6,000 persons, many of whom are women. Women also work to a considerable extent in the manufacture of cigars.

Conditions of employment.—The conditions of employment vary in the different industries. The hours of labor prescribed for women regulate to some extent those of men in industries where both are employed, and Saturday afternoon half holiday is the custom in most of the factory occupations. The cotton operatives are relatively

¹ Manchester, a Brief Record of Its Past and a Picture of Its Present, p. 21. Maurice D. Clarke, compiler, Manchester, N. H., 1875.



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PART I. ANALYSIS OF FINDINGS.

INFANT MORTALITY RATE.

In the detailed study of infant life and mortality in Manchester the sample was composed, as we have seen, of 1,643 registered infants during the 12-month period ended October 31, 1913. Of these, 67 or 4.8 per cent, were stillborn, and of the 1,564 live born, 258 died before 1 year of age, making an infant mortality rate of 165.

AGE AT DEATH.

The largest proportion of deaths occurred in the early period of infancy, which always makes the greatest inroads upon infant life, especially is this true of the first few days. In the first week 17.8 per cent of all deaths occurred, constituting 17.8 per cent of all deaths. If the same number had occurred in each succeeding week, all the babies would have been dead before the end of eight months. On the first day the percentage of deaths was higher than on any other day, and although it continued high for a number of weeks it declined progressively from the day of birth to the end of the year.

Age at death.	Deaths among infants born during selected year to—									
	All mothers.		Native mothers.		Foreign-born mothers.					
	Number.	Per cent distribution.	Number.	Per cent distribution.	Number.	Per cent distribution.	French-Canadian mothers.		Other foreign-born mothers.	
							Number.	Per cent distribution.	Number.	Per cent distribution.
All ages.....	258	100.0	67	100.0	191	100.0	129	100.0	62	100.0
First month.....	72	27.9	16	23.9	56	29.3	38	29.5	18	29.0
First day but less than 2.....	17	6.6	4	6.0	13	6.8	11	8.5	2	3.2
2 days but less than 3.....	6	2.3	2	3.0	4	2.1	2	1.6	2	3.2
3 days but less than 4.....	8	3.1	2	3.0	6	3.2	7	5.4	1	1.6
4 days but less than 5.....	15	5.8	2	3.0	13	6.8	8	6.2	5	8.1
5 days but less than 6.....	10	3.9	5	7.5	5	2.6	2	1.6	3	4.8
6 days but less than 7.....	16	6.2	3	4.5	13	6.8	8	6.2	5	8.1
7 days but less than 8.....	24	9.3	4	6.0	20	10.5	15	11.6	5	8.1
8 days but less than 9.....	24	9.3	4	6.0	20	10.5	10	7.8	10	16.1
9 days but less than 10.....	57	22.1	22	32.8	35	18.3	26	20.2	9	14.5
10 days but less than 11.....	49	19.0	14	20.9	35	18.3	27	20.9	8	12.9
11 days but less than 12.....	32	12.4	7	10.4	25	13.1	13	10.1	12	19.4

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The number of infant deaths during the early months does not indicate that in Manchester the whole problem of prevention of infant mortality lies among the younger babies. The death rate, though on the decline as the babies grew older, nevertheless continued sufficiently high to the end of the 12-month period to be susceptible of considerable reduction. In the group under consideration 32 deaths occurred during the last quarter of the first year of life, and even this number per quarter would have given an infant mortality rate of 81.8. Such a rate, based upon the assumption that the deaths were evenly distributed throughout the first year, would be unduly high considering that some communities have reduced their actual rate to or below that point. (See Table 7.)

The number of deaths in each month of age is shown graphically in the following diagram. From 72 in the first month the number of deaths drops sharply to 24 in the second month, and thereafter there is a general tendency for the number to decrease each month except the ninth, in which occurs a marked increase.

DIAGRAM II.—INFANT DEATHS OCCURRING IN SPECIFIED MONTH OF AGE.

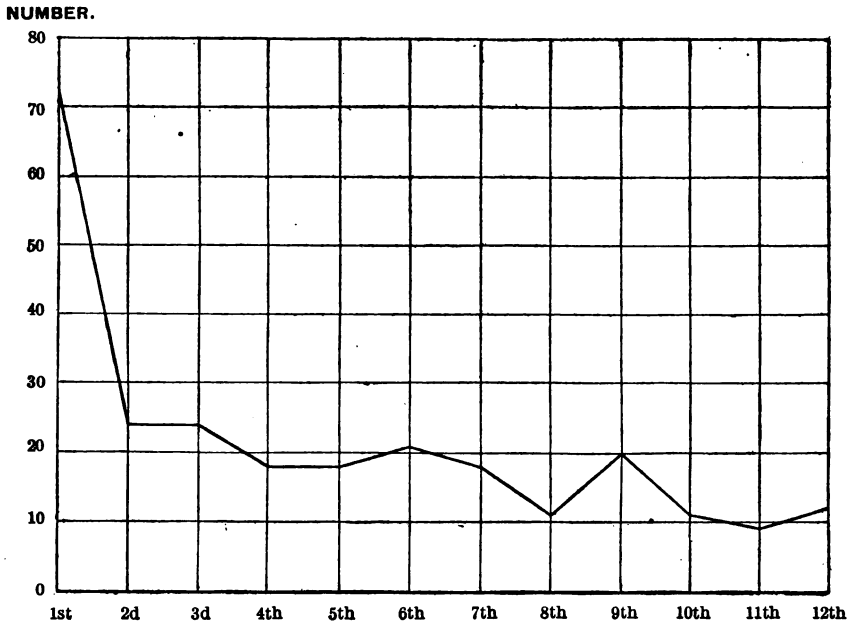


TABLE 7.

Cause of death.	Deaths among infants born during selected year.												
	Total deaths.	Occurring in specified month of age.											
		First.			Second.	Third.	Fourth.	Fifth.	Sixth.	Seventh.	Eighth.	Ninth.	Tenth.
		Total.	Under 2 weeks.	2 weeks but under 1 month.									
All causes	258	72	56	16	24	24	18	18	21	18	11	20	11
Gastric and intestinal diseases	99	10	4	6	9	10	11	11	10	8	7	11	6
Respiratory diseases	41	4	2	2	6	5	2	3	3	5	3	2	3
Malformations	14	10	8	2	3	3	4	4	4	2	1	1	3
Early infancy	62	38	34	4	5	2	4	4	4	2	1	1	1
Premature birth	23	23	23										
Congenital debility	38	14	10	4	5	2	4	4	4	2	1	1	
Injuries at birth	1	1	1										
Epidemic diseases	5	1		1			1			1		1	
Diseases ill defined or unknown	11	3	2	1	1	2		1	1	1		1	
All other causes	26	6	6		3	2	2	2	3	1		3	2

MEDICAL CAUSE OF DEATH.

Infant deaths are classified by the medical cause of death, which is the immediate cause only. Back of it lie, frequently, economic and social causes. Such conditions as poverty, ignorance in the care of the baby, the work of the mother, and artificial feeding may all share in the responsibility for death.

Gastric and intestinal diseases.—The diseases of infancy most commonly fatal in Manchester were the principal diseases of the digestive tract or gastric and intestinal diseases; they were responsible for 99 deaths, or 38.4 per cent of the entire number.

The proportion of deaths from gastric and intestinal diseases in Manchester as compared with that in the registration area in 1913 is of significance in connection with the city's high infant death rate. Deaths from this class of diseases are commonly believed to be in a large degree preventable,¹ and hence attempts to reduce infant mortality frequently have been confined largely to efforts to reduce the number of deaths from these diseases. The methods commonly employed have been the improvement of the milk supply, the establishment of infant-welfare stations and of agencies which distribute pure and modified milk to mothers of young babies and give instruction to

¹ Prof. Irving Fisher, in his Report on National Vitality, prepared for the National Conservation Committee, p. 11, says: "Using the statistics, experience, and estimate of 18 physicians as to the preventability of each of the list of 90 causes of death, we find that the length of life could easily be increased from 45 to 60 * * *. The principal reduction would be from infantile diarrhea and enteritis, over 60 per cent of which could be prevented."

and furnish other means of disseminating information in regard to proper care and feeding of babies. In Manchester there were infant-welfare stations maintained by private philanthropy during the summer months.

Detailed International List number. ¹	Cause of death. ²	Infant deaths in—			
		Manchester.		Registration area, 1913.	
		Num- ber.	Per cent distribu- tion.	Number.	Per cent distribu- tion.
	All causes.....	258	100.0	159,435	100.0
	Gastric and intestinal diseases ³	99	38.4	41,379	26.0
24	Diseases of the stomach.....	3	1.2	2,924	1.8
25	Diarrhea and enteritis.....	96	37.2	38,455	24.1
20	Respiratory diseases ⁴	41	15.9	24,285	15.2
23	Acute bronchitis.....	13	5.0	3,665	2.3
22	Broncho-pneumonia.....	17	6.6	13,100	8.2
33	Pneumonia.....	11	4.3	7,520	4.7
33	Malformations.....	14	5.4	8,813	5.5
33	Early infancy.....	62	24.0	52,865	33.2
33	Premature birth.....	23	8.9	27,359	17.2
33	151[1]				
33	151[2], 152[2], 153	38	14.7	20,375	12.8
37	152[1]				
5	Injuries at birth.....	1	.4	5,131	3.2
6	Epidemic diseases ⁵	5	1.9	13,390	8.4
7	Measles.....	1	.4	2,011	1.3
8	Scarlet fever.....			255	.2
9	Whooping cough.....	4	1.6	3,442	2.2
12	Diphtheria and croup.....			913	.6
12	Influenza.....			608	.4
37	Dysentery.....			651	.4
14	Erysipelas.....			756	.5
37	Tetanus.....			369	.2
15	Tuberculosis of the lungs.....			848	.5
14	Tuberculous meningitis.....			1,230	.8
35	Other forms of tuberculosis.....			413	.3
37	Syphilis.....			1,894	1.2
35	External causes.....			1,892	1.2
38	Diseases ill defined or unknown.....	11	4.3	3,292	2.1
17	All other causes.....	26	10.1	13,519	8.5
17	Meningitis.....	11	4.3	1,739	1.1
17	Convulsions.....	7	2.7	3,125	2.0
9	Organic diseases of the heart.....	1	.4	748	.5
	Other.....	7	2.7	7,907	5.0

Numbers indicate the classification in the abridged and the detailed lists, respectively, of the International List of Causes of Death.

Uses of death included in this list are those used by the U. S. Bureau of the Census (see *Mortality Statistics*, 1913, p. 577) in classifying the deaths of infants under 1 year. They are those causes of groups of causes which are most important at this age. The numbers of the detailed and international lists will facilitate their identification. In order to make discussion of the figures these causes of death have been grouped in 8 main groups.

m "gastric and intestinal diseases," as used in the tables and discussion, includes, as above by the diseases of this type which are most important among infants; i. e., diseases of the diarrhea, and enteritis. It does not include all "diseases of the digestive system" as classified heading according to the detailed International List.

m "respiratory diseases," as used in the tables and discussion, similarly includes only those of respiratory diseases which are most important among infants; i. e., acute bronchitis, broncho-pneumonia. It does not include all "diseases of the respiratory system" as classified under heading according to the detailed International List.

m "epidemic diseases," as used in the tables and discussion, includes only those of this group most important among infants.

TABLE 9.

Cause of death.	Deaths among infants born during selected year to—					
	All mothers.			Native mothers.		
	Number.	Infant mortality rate.	Per cent distribution.	Number.	Infant mortality rate.	Per cent distribution.
All causes.....	258	165.0	100.0	67	128.1	100.0
Gastric and intestinal diseases.....	99	63.3	38.4	29	55.4	43.3
Respiratory diseases.....	41	26.2	15.9	12	22.9	17.9
Malformations.....	14	9.0	5.4	1	1.9	1.5
Early infancy.....	62	39.6	24.0	19	36.3	28.4
Premature birth.....	23	14.7	8.9	7	13.4	10.4
Congenital debility.....	38	24.3	14.7	12	22.9	17.9
Injuries at birth.....	1	.6	.4			
Epidemic diseases.....	5	3.2	1.9	1	1.9	1.5
Diseases ill defined or unknown.....	11	7.0	4.3			
All other causes.....	26	16.6	10.1	5	9.6	7.5

Cause of death.	Deaths among infants born during selected year to foreign-born mothers.								
	Num-ber.	Infant mortal-ity rate.	Per cent distri-bution.	French-Canadian mothers.			Other foreign-born mothers.		
				Num-ber.	Infant mortal-ity rate.	Per cent distri-bution.	Num-ber.	Infant mortal-ity rate.	Per cent distri-bution.
All causes.....	191	183.5	100.0	129	224.7	100.0	62	132.8	100.0
Gastric and intestinal diseases.....	70	67.2	36.6	54	94.1	41.9	16	34.3	25.8
Respiratory diseases.....	29	27.9	15.2	18	31.4	14.0	11	23.6	17.7
Malformations.....	13	12.5	6.8	7	12.2	5.4	6	12.8	9.7
Early infancy.....	43	41.3	22.5	30	52.3	23.3	13	27.8	21.0
Premature birth.....	16	15.4	8.4	14	24.4	10.9	2	4.3	3.2
Congenital debility.....	26	25.0	13.6	15	26.1	11.6	11	23.6	17.7
Injuries at birth.....	1	1.0	.5	1	1.7	.8			
Epidemic diseases.....	4	3.8	2.1	3	5.2	2.3	1	2.1	1.6
Diseases ill defined or unknown.....	11	10.6	5.8	5	8.7	3.9	6	12.8	9.7
All other causes.....	21	20.2	11.0	12	20.9	9.3	9	19.3	14.5

A distribution of deaths by cause in the several wards shows a proportionately large number of deaths from gastric and intestinal diseases in every ward—in all but the fifth and seventh wards more than a third of all the deaths. In ward 2, in which the largest number of deaths occurs, 45.1 per cent of this number were from gastric and intestinal diseases. It would seem, therefore, that a reduction of infant mortality not only in the city as a whole but in practically every ward of the city is largely a matter of reducing the number of deaths from this one cause.

10. Cause of death.	Deaths among infants born during selected year.									
	Total.	Ward of residence.								
		1	2	3	4	5	6	7	8	9
All causes.....	258	19	51	27	34	17	22	21	19	48
and intestinal diseases.	99	7	23	10	13	5	9	5	9	18
tory diseases.....	41	.....	6	2	10	2	6	4	4	7
ations.....	14	2	2	1	1	1	2	2	1	2
fancy.....	62	8	14	7	4	6	5	5	2	11
nature birth.....	23	3	5	2	.....	4	4	2	1	2
genital debility.....	38	5	8	5	4	2	1	3	1	9
ries at birth.....	1	.....	1	.....	.....	.....	.....	.....	.....	.....
c diseases.....	5	.....	1	1	.....	1	.....	1	.....	1
ill defined or un-	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
causes.....	11	1	2	2	3	1	.....	1	.....	1
causes.....	26	1	3	4	3	1	.....	3	3	8

PER CENT DISTRIBUTION.

causes.....	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
and intestinal diseases.	38.4	36.8	45.1	37.0	38.2	29.4	40.9	23.8	47.4	37.5
ry diseases.....	15.9	.....	11.8	7.4	29.4	11.8	27.3	19.0	21.1	14.6
ions.....	5.4	10.5	3.9	3.7	2.9	5.9	9.1	9.5	5.3	4.2
ney.....	24.0	42.1	27.5	25.9	11.8	35.3	22.7	23.8	10.5	22.9
nature birth.....	8.9	15.8	9.8	7.4	.....	23.5	18.2	9.5	5.3	4.2
nital debility.....	14.7	26.3	15.7	18.5	11.8	11.8	4.5	14.3	5.3	18.8
s at birth.....	.4	.....	2.0	.....	.....	.....	.....	.....	.....	.....
diseases.....	1.9	.....	2.0	3.7	.....	5.9	.....	4.8	.....	2.1
ill defined or un-	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
causes.....	4.3	5.3	3.9	7.4	8.8	5.9	.....	4.8	.....	2.1
causes.....	10.1	5.3	5.9	14.8	8.8	5.9	.....	14.3	15.8	16.7

SEASON AND CLIMATE.

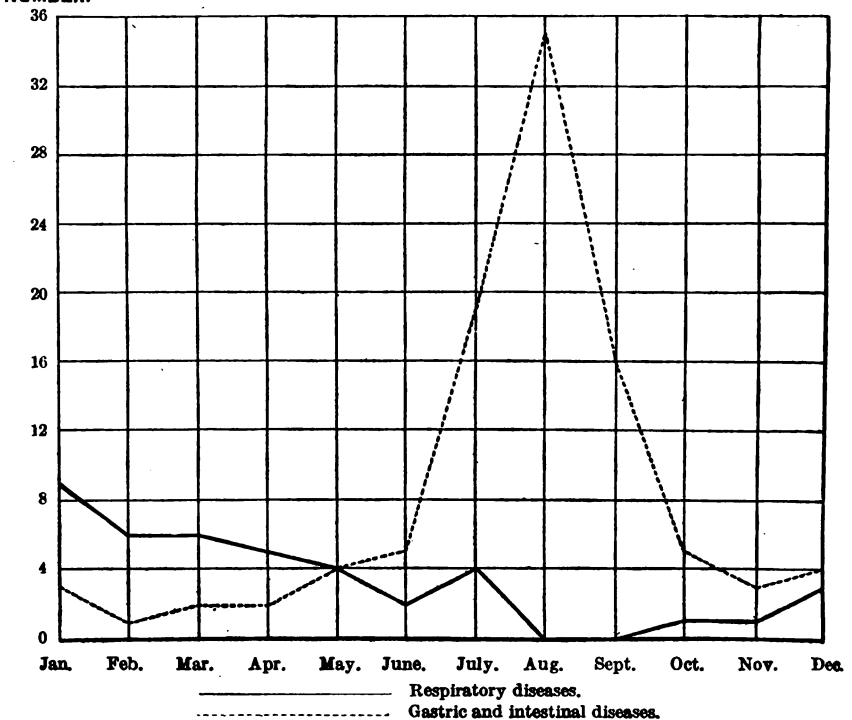
his by seasons.—The season of the year has a close relation medical cause of death. The data obtained in Manchester point agree with observation and experience generally. The months are hardest for the baby on account of the greater ice of gastric and intestinal diseases during the warm weather. The months showing the largest number of infant deaths were August, and September, with 32, 48, and 27 deaths, respectively, of which months a large proportion of the deaths was from and intestinal causes. In August 35 deaths were from these alone, more than occurred in any other month from all combined. May showed the next largest number of deaths, 25, but no one cause predominated, and apparently climatic causes do not explain the large number. In January and February, the coldest months in Manchester, also occurred a relatively small number of deaths, 22 and 20, respectively. Deaths from respiratory diseases occurred chiefly in these two months and in the next March and April, which cover the break-up of winter. The distribution of months of deaths due to other causes showed no striking difference of significance. (See Table 11.)

The prevalence of gastric and intestinal diseases in summer and of respiratory diseases in winter is shown graphically in Diagram III. The rapid increase in the number of deaths from gastric and intestinal diseases from June to August and the equally rapid decrease in the number from August to October are the significant points brought out.

TABLE 11.

Cause of death.	Deaths among infants born during selected year.												
	Total.	Occurring in specified month.											
		January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
All causes	258	22	20	15	15	25	17	32	48	27	13	9	15
Gastric and intestinal diseases	99	3	1	2	2	4	5	19	35	16	5	3	4
Respiratory diseases	41	9	6	6	5	4	2	4	.....	.....	1	1	3
Malformations	14	1	3	1	3	.....	.....	4	.....	.....	.....	1	1
Early infancy	62	5	5	5	1	9	8	4	8	7	3	2	5
Premature birth	23	1	2	1	.....	3	4	2	4	3	1	.....	2
Congenital debility	38	4	3	3	1	6	4	2	4	4	2	2	3
Injuries at birth	1	.....	.....	1	.....	.....	.....	.....	.....	.....	.....	.....	.....
Epidemic diseases	5	.....	.....	.....	1	2	.....	.....	1	1	.....	.....	.....
Diseases ill defined or unknown	11	1	1	.....	.....	2	1	.....	3	.....	2	1	.....
All other causes	26	3	4	1	3	4	1	1	1	3	2	1	2

DIAGRAM III.—INFANT DEATHS OCCURRING IN SPECIFIED MONTH, FROM GASTRIC AND INTESTINAL DISEASES AND RESPIRATORY DISEASES.



Climate.—The climate of Manchester apparently offers no special disadvantage to infant life unless it be that the long, cold winters may swell the death rate from broncho-pneumonia and other respiratory diseases. The climate is somewhat more equable than that of the same latitude (40° north) farther west, and the average rainfall is greater. It is generally regarded as agreeable and healthful and the high death rate from gastric and intestinal diseases in the summer months can not be ascribed to exceptionally long, hot summers. The average temperature in 1913 at Concord, N. H., the nearest United States meteorological station, was 48° F.; the highest temperature of the year was 99° in July; the lowest, -7° in February. The records of the United States Weather Bureau were also examined to discover whether the seasonal conditions which prevailed in Manchester during the period covered by the investigation were in any way exceptional, but such was found not to be the case.

Month of birth.—Another factor to be taken into consideration in connection with the distribution of deaths by cause and season is the month of birth. The baby's age when subjected to special hazards, such as summer heat and diarrheal epidemics, makes a difference in its power of resistance. Babies born during the late summer and early fall months in Manchester appeared to have the best chance of survival. October babies made the best showing of all, with an infant mortality rate of but 90.9. August and September babies showed rates of 119.7 and 117.2, respectively. Babies born in May and June, who were very young to face the summer months, had the highest death rates, namely, 227.3 and 234, respectively. Babies born in July and August had lower death rates, perhaps because fewer of them were weaned before the end of the hot season. The numbers, however, are too small to justify any positive deductions.

TABLE 12.

Month of birth.	Births during selected year and infant deaths.					
	Total births.	Live births.			Stillbirths.	
		Total.	Infant deaths.		Number.	Per cent.
			Number.	Infant mortality rate.		
The year.....	1,643	1,564	258	165.0	79	4.8
November, 1912.....	118	109	24	220.2	9	7.6
December, 1912.....	124	111	14	126.1	13	10.5
January, 1913.....	130	127	26	204.7	3	2.3
February, 1913.....	134	128	21	164.1	6	4.5
March, 1913.....	139	135	20	148.1	4	2.9
April, 1913.....	152	148	24	162.2	4	2.6
May, 1913.....	138	132	30	227.3	6	4.3
June, 1913.....	146	141	33	234.0	5	3.4
July, 1913.....	149	142	23	162.0	7	4.7
August, 1913.....	147	142	17	119.7	5	3.4
September, 1913.....	138	128	15	117.2	10	7.2
October, 1913.....	128	121	11	90.9	7	5.5

INFANT MORTALITY.

TABLE 13.

TABLE 13.	Deaths among infants born during selected year.												
	Month of birth.	Total.	Occurring in specified month of age.										
			First.	Second.	Thrd.	Fourth.	Fifth.	Sixth.	Seventh.	Elghth.	Ninth.	Tenth.	Eleventh.	Twelfth.
The year.....	258	72	24	24	18	18	21	18	11	20	11	9	12
November, 1912.....	24	5	3	3	.....	1	2	.....	1	5	2	1	1
December, 1912.....	14	3	.....	2	.....	.....	.....	1	1	2	3	2	.....
January, 1913.....	26	7	4	1	2	1	3	4	2	2	.....	.....	.....
February, 1913.....	21	7	1	.....	1	1	3	4	.....	1	1	.....	2
March, 1913.....	20	5	2	2	1	3	3	1	1	.....	1	1	.....
April, 1913.....	24	5	.....	2	6	4	3	.....	.....	1	1	1	1
May, 1913.....	30	9	1	5	2	1	2	1	3	1	1	2	2
June, 1913.....	33	7	8	4	1	3	1	1	1	2	1	1	3
July, 1913.....	23	9	1	4	.....	1	2	1	.....	.....	3	2	2
August, 1913.....	17	8	1	1	2	.....	.....	3	1	1	.....	.....	.....
September, 1913.....	15	5	.....	.....	.....	2	1	.....	.....	3	2	.....	1
October, 1913.....	11	2	3	.....	2	1	.....	2	.....	1	.....	.....	.....

TABLE 14.

Month of birth.	Deaths among infants born during selected year.											
	Total.	Occurring in specified year and month.										
		1912		1913								
		November.	December.	January.	February.	March.	April.	May.	June.	July.	August.	September.
The year.....	258	4	6	8	12	10	9	14	12	20	47	27
November, 1912.....	24	4	3	2	2	1	1	1	1	1	5	2
December, 1912.....	14	.....	3	.....	1	1	.....	1	.....	2	1	4
January, 1913.....	26	.....	.....	6	3	3	.....	2	1	5	4	2
February, 1913.....	21	.....	.....	.....	6	2	.....	.....	.....	4	3	1
March, 1913.....	20	.....	.....	.....	.....	3	4	.....	3	1	4	2
April, 1913.....	24	.....	.....	.....	.....	.....	4	1	1	3	6	5
May, 1913.....	30	.....	.....	.....	.....	.....	.....	8	1	5	2	2
June, 1913.....	33	.....	.....	.....	.....	.....	.....	.....	1	5	2	2
July, 1913.....	23	.....	.....	.....	.....	.....	.....	.....	5	3	9	2
August, 1913.....	17	.....	.....	.....	.....	.....	.....	.....	.....	5	5	2
September, 1913.....	15	.....	.....	.....	.....	.....	.....	.....	.....	.....	8	1
October, 1913.....	11	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	4

Month of birth.	Occurring in specified year and month—Continued.										
	1913			1914							
	October.	November.	December.	January.	February.	March.	April.	May.	June.	July.	August.
The year.....	13	5	9	14	8	5	6	11	5	3	1
November, 1912.....	.....	1	.....	.....	.....	.....	.....	.....	.....	.....	.....
December, 1912.....	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
January, 1913.....	.....	.....	.....	1	1	.....	.....	.....	.....	.....	.....
February, 1913.....	1	1	.....	.....	.....	.....	.....	.....	.....	.....	.....
March, 1913.....	1	.....	.....	2	2	.....	.....	.....	.....	.....	.....
April, 1913.....	.....	.....	.....	2	2	1	1	.....	.....	.....	.....
May, 1913.....	1	1	2	2	1	1	2	2	.....	.....	.....
June, 1913.....	3	1	1	2	2	.....	2	2	1	.....	.....
July, 1913.....	2	.....	2	1	1	.....	.....	2	2	1	.....
August, 1913.....	1	1	1	.....	.....	3	1	1	.....	.....	1
September, 1913.....	1	.....	.....	3	1	.....	.....	2	2	1	1
October, 1913.....	2	.....	3	1	2	.....	.....	2	.....	1	.....

STILLBIRTHS.

A total of 79 stillbirths occurred among the 1,643 births included in this study. The problem of stillbirths is closely connected with that of the deaths of live-born infants, especially the deaths due to prematurity and other prenatal causes. The stillbirth rate, or percentage of stillbirths, is given in most of the general tables parallel with the infant mortality rate.

The 79 stillbirths formed 4.8 per cent of all births considered in this study. No doubt this is an understatement of the actual number, as the registration of stillbirths is even less complete than that of live births.

Nationality of mother.—The percentage of stillbirths reported for foreign-born mothers was 4.9, slightly higher than that reported for native mothers, for whom it was 4.6. The highest percentage was found among the group of English, Irish, and Scotch mothers. Births to the combined group numbered 115 and 9 of these, or 7.8 per cent, were stillbirths. Among the French-Canadian mothers there were 36 stillbirths, or 5.9 per cent of all births; among Polish mothers only 6, or 3.5 per cent of all births.

Nationality of mother.	Births during selected year and infant deaths.					
	Total births.	Live births.			Stillbirths.	
		Total.	Infant deaths.		Number.	Per cent. ¹
			Number.	Infant mortality rate. ¹		
All mothers.....	1,643	1,564	258	165.0	79	4.8
Native mothers.....	548	523	67	128.1	25	4.6
Foreign-born mothers.....	1,095	1,041	191	183.5	54	4.9
Canadian, French.....	610	574	129	224.7	36	5.9
Canadian, except French.....	27	27	4	.....	.....	.....
Polish.....	170	164	31	189.0	6	3.5
English, Irish, Scotch.....	115	106	7	66.0	9	7.8
Greek and Syrian.....	72	71	10	.....	1	.....
German.....	30	29	2	.....	1	.....
Jewish.....	24	24	2	.....	.....	.....
Ruthenian and Lithuanian.....	22	21	3	.....	1	.....
All other and not reported.....	25	25	3	.....	.....	.....

¹ Not shown where base is less than 100.

Gainful employment of mother.—Gainful employment of the mothers at some time during pregnancy might be expected, perhaps, to show a more definite relation to a high percentage of stillbirths than any other factor considered in this study. To some degree this appears to be the case for the group of babies under consideration. Mothers gainfully employed had a higher percentage than all mothers or than those not gainfully employed, but the highest percentage

occurred among the mothers gainfully employed away from home and the lowest among those gainfully employed at home.

TABLE 16. Employment of mother during year before baby's birth.		Per cent of still- births.
All mothers.....		4.8
Not gainfully employed.....		4.1
Gainfully employed.....		5.5
At home.....		1.8
Away from home.....		7.5

The percentage of stillbirths was markedly higher among the older mothers. Among babies of mothers 40 and over they formed 8.9 per cent of all births. Among babies of mothers aged 20 to 24 the percentage was lowest, namely, 3.8. In the two intervening classes, mothers aged 25 to 29 and those aged 30 to 39, the percentages were 4.9 and 4.5, respectively. Births to mothers under 20 numbered 64 and included 5 stillbirths. (See Table 19.)

SEX.

The infant mortality rate among the male infants was higher than that among the female, a result in accord with general experience as shown in practically all vital statistics giving such rates. The difference in rate is much more marked among the natives.

TABLE 17.		Births during selected year and infant deaths.				
Sex of baby and nativity of mother.		Total births.	Live births.		Stillbirths.	
			Total.	Infant deaths.		Per cent.
				Number.	Infant mortality rate.	
All mothers.....		1,643	1,564	258	165.0	4.8
Male.....		826	781	149	190.8	5.4
Female.....		817	783	109	139.2	4.2
Native mothers.....		548	523	67	128.1	4.6
Male.....		268	255	44	172.5	4.9
Female.....		280	268	23	85.8	4.3
Foreign-born mothers.....		1,095	1,041	191	183.5	4.9
Male.....		558	526	105	199.6	5.7
Female.....		537	515	86	167.0	4.1

Masculinity.—It will be noted also that the group studied shows a preponderance of male births, which fact also coincides with the usual showing for birth statistics. The ratio of sexes usually is expressed by the term masculinity, which for our group is 1,011—

that is, 1,011 male births to 1,000 female births. In their contribution to national demography,¹ C. J. Lewis and J. Norman Lewis present some interesting figures concerning the variation of the magnitude of masculinity, and state that "The proportion of masculine and feminine births must be the result of definite causes, and dependent on laws which are not yet adequately known," and that "Under present conditions the possession of a positive masculinity appears to be an integral necessity of a vigorous nationality. The reason for this lies in the heavier mortality which the male suffers as compared with the female in the early years of life. Male children perish not only in early years, but even in early months, at a greater rate than their sisters." Later, "The masculinity of a people rarely exceeds 1,100 or falls below 900," but, "The masculinity of stillbirths is never lower than 1,200, and rises in one instance to 1,700, though it is generally about 1,300."

The variation in masculinity among the babies of native and of foreign-born mothers in Manchester as indicated below is in practical accord with the findings above quoted:

TABLE 18. Nativity of mother.	Masculinity (number of male per 1,000 female births).		
	All births.	Live births.	Stillbirths.
All mothers	1,011	997	1,324
Native mothers	957	952	1,083
Foreign-born mothers	1,039	1,021	1,455

AGE OF MOTHER AND ORDER OF BIRTH.

Age of mother.—The age of the mother at the time of the birth of the baby is another possible factor in infant mortality. A very high proportion of infant deaths occurred among babies born during the selected year to mothers who were 40 years of age and over—19 out of 92 live births. The highest rates, however, were found among the babies of mothers under 25 years of age. The babies of mothers aged from 30 to 39 had a rate of 146.6, which was the lowest found for any group of mothers classified according to age. The rate for this same group differs markedly, however, for native and foreign-born mothers, the babies of native mothers having a rate of 71.4 only, while those of foreign-born mothers had a rate of 176.6. The lowest infant mortality rate for any age group of foreign-born mothers occurred among babies of mothers aged from 25 to 29—namely, a rate of 165. (See Table 19.)

¹ Lewis, C. J. and J. Norman, *Natality and Fecundity*, London, 1906, pp. 110, 111, 121.

These numbers are too small to warrant any general conclusions in regard to the influence of the mother's age upon the infant mortality rate. Individual circumstances and the order of birth of the baby are so closely connected with the question of the age of the mother that caution must be used in drawing inferences based on age alone.

TABLE 19.

Age of mother at birth of child, and nativity.	Births during selected year and infant deaths.					
	Total births.	Live births.			Stillbirths.	
		Total.	Infant deaths.		Number.	Per cent. ¹
			Number.	Infant mortality rate. ¹		
All mothers.....	1,643	1,564	258	165.0	79	4.8
Under 25.....	540	517	95	183.8	23	4.3
Under 20.....	64	59	12		5	
20 to 24.....	476	458	83	181.2	18	3.8
25 to 29.....	487	463	71	153.3	24	4.9
30 to 39.....	514	491	72	146.6	23	4.5
40 and over.....	101	92	19		9	8.9
Not reported.....	1	1	1			
Native mothers.....	548	523	67	128.1	25	4.6
Under 25.....	227	217	34	156.7	10	4.4
Under 20.....	33	30	5		3	
20 to 24.....	194	187	29	155.1	7	3.6
25 to 29.....	163	154	20	129.9	9	5.5
30 to 39.....	144	140	10	71.4	4	2.8
40 and over.....	14	12	3		2	
Foreign-born mothers.....	1,095	1,041	191	183.5	54	4.9
Under 25.....	313	300	61	203.3	13	4.2
Under 20.....	31	29	7		2	
20 to 24.....	282	271	54	199.3	11	3.9
25 to 29.....	324	309	51	165.0	15	4.6
30 to 39.....	370	351	62	176.6	19	5.1
40 and over.....	87	80	16		7	
Not reported.....	1	1	1			

¹ Not shown where base is less than 100.

Order of birth.—The babies scheduled ranged from the first to the eighteenth child of the mother. Though the numbers on the whole for infants born during the selected year are too small to establish conclusively a biological tendency, one or two facts of significance emerge. First-born children had a markedly higher death rate than second-born children. Fluctuations in the rate according to order of birth after the second showed no special relation, except in the case of exceptionally large families. Babies ninth and later in order of birth, of whom there were 144 live born, had an infant mortality rate of 250, a rate higher than that for any earlier born or for the whole group of earlier born babies, which was 156.3. This fact may explain the higher rate among foreign-born than among native mothers in the age group 30 to 39. Foreign-born girls as a rule marry early and are more likely to have had by this time of life a large number of

is not possible, however, to determine exactly the relative of the order of birth as an independent factor in the high infant mortality rate in Manchester.

Order of birth, and nationality of mother.	Births during selected year and infant deaths.					
	Total births.	Live births.			Stillbirths.	
		Total.	Infant deaths.		Number.	Per cent. ¹
			Number.	Infant mortality rate. ¹		
First-born.....	1,643	1,564	258	165.0	79	4.8
Second-born.....	454	427	71	166.3	27	5.9
Third-born.....	317	310	39	125.8	7	2.2
Fourth-born.....	226	218	36	165.1	8	3.5
Fifth-born.....	158	150	30	200.0	8	5.1
Sixth-born.....	114	108	12	111.1	6	5.3
Seventh-born.....	221	207	34	164.3	14	6.3
Eighth-born.....	153	144	36	250.0	9	5.9
Mothers.....	548	523	67	128.1	25	4.6
First-born.....	198	184	16	87.0	14	7.1
Second-born.....	126	124	16	129.0	2	1.6
Third-born.....	90	88	12	.....	2	.....
Fourth-born.....	42	40	10	.....	2	.....
Fifth-born.....	31	31	4	.....	.....	.....
Sixth-born.....	46	43	6	.....	3	.....
Seventh-born.....	15	13	3	.....	2	.....
Non-born mothers.....	1,095	1,041	191	183.5	54	4.9
First-born.....	256	243	55	226.3	13	5.1
Second-born.....	191	186	23	123.7	5	2.6
Third-born.....	136	130	24	184.6	6	4.4
Fourth-born.....	116	110	20	181.8	6	5.2
Fifth-born.....	83	77	8	.....	6	.....
Sixth-born.....	175	164	28	170.7	11	6.3
Seventh-born.....	138	131	33	251.9	7	5.1
Non-Canadian mothers.....	610	574	129	224.7	36	5.9
First-born.....	130	122	36	295.1	8	6.2
Second-born.....	99	95	13	.....	4	.....
Third-born.....	64	60	18	.....	4	.....
Fourth-born.....	59	54	8	.....	5	.....
Fifth-born.....	49	44	5	.....	5	.....
Sixth-born.....	103	98	21	.....	5	4.9
Seventh-born.....	106	101	28	277.2	5	4.7
For foreign-born mothers.....	485	467	62	132.8	18	3.7
First-born.....	126	121	19	157.0	5	4.0
Second-born.....	92	91	10	.....	1	.....
Third-born.....	72	70	6	.....	2	.....
Fourth-born.....	57	56	12	.....	1	.....
Fifth-born.....	34	33	3	.....	1	.....
Sixth-born.....	72	66	7	6
Seventh-born.....	32	30	5	2

¹ Not shown where base is less than 100.



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TABLE 22. Number of child in order of birth.	Infants born during selected year.									
	Total.		Whose fathers earned specified amount.							
			Under \$450.		\$450 to \$549.		\$550 to \$649.		\$650 to \$849.	
	Num- ber.	Per cent distrib- ution.	Num- ber.	Per cent distrib- ution.	Num- ber.	Per cent distrib- ution.	Num- ber.	Per cent distrib- ution.	Num- ber.	Per cent distrib- ution.
Total.....	1,643	100.0	225	100.0	274	100.0	297	100.0	426	100.0
First.....	454	27.6	66	29.3	72	26.3	92	31.0	90	21.1
Second.....	317	19.3	40	17.8	51	18.6	49	16.5	92	21.6
Third.....	226	13.8	32	14.2	39	14.2	29	9.8	68	16.0
Fourth.....	158	9.6	26	11.6	27	9.9	28	9.4	47	11.0
Fifth.....	114	6.9	14	6.2	13	4.7	29	9.8	28	6.6
Sixth.....	96	5.8	13	5.8	14	5.1	20	6.7	28	6.6
Seventh.....	74	4.5	9	4.0	15	5.5	16	5.4	17	4.0
Eighth.....	51	3.1	3	1.3	7	2.6	12	4.0	17	4.0
Ninth.....	39	2.4	7	3.1	6	2.2	2	.7	9	2.1
Tenth.....	37	2.3	7	3.1	5	1.8	5	1.7	14	3.3
Eleventh.....	25	1.5	3	1.3	7	2.6	3	1.0	8	1.9
Twelfth.....	20	1.2	1	.4	10	3.6	4	1.3	3	.7
Thirteenth.....	13	.8	2	.9	3	1.1	3	1.0	1	.2
Fourteenth.....	9	.5	2	.9			2	.7	3	.7
Fifteenth.....	3	.2			1	.4	1	.3		
Sixteenth.....	6	.4			3	1.1	2	.7	1	.2
Eighteenth.....	1	.1			1	.4				

	Whose fathers earned specified amount—Continued.									
	\$850 to \$1,049.		\$1,050 to \$1,249.*		\$1,250 and over.		No earnings. ¹		Not reported.	
	Num- ber.	Per cent distrib- ution.	Num- ber.	Per cent distrib- ution.	Num- ber.	Per cent distrib- ution.	Num- ber.	Per cent distrib- ution.	Num- ber.	Per cent distrib- ution.
Total.....	199	100.0	72	100.0	105	100.0	24	100.0	21	100.0
First.....	61	30.7	21	29.2	38	36.2	9	37.5	5	23.8
Second.....	42	21.1	14	19.4	27	25.7			2	9.5
Third.....	32	16.1	10	13.9	9	8.6	4	16.7	3	14.3
Fourth.....	10	5.0	6	8.3	9	8.6	3	12.5	2	9.5
Fifth.....	16	8.0	5	6.9	6	5.7	1	4.2	2	9.5
Sixth.....	11	5.5	4	5.6	4	3.8	1	4.2	1	4.8
Seventh.....	9	4.5	1	1.4	5	4.8			2	9.5
Eighth.....	6	3.0	2	4.2	2	1.9	1	4.2		
Ninth.....	4	2.0	4	5.6	3	2.9	3	12.5	1	4.8
Tenth.....	1	.5	1	1.4	1	1.0			3	14.3
Eleventh.....	2	1.0	1	1.4			1	4.2		
Twelfth.....	2	1.0								
Thirteenth.....	2	1.0	1	1.4			1	4.2		
Fourteenth.....	1	.5			1	1.0				
Fifteenth.....			1	1.4						

* Includes 1 father living on his income.

ATTENDANT AT BIRTH.

The question of attendant at birth is of importance in all communities and especially in those with a large foreign population accustomed to the services of a midwife or even to some extent to doing without trained care at childbirth. In Manchester, however, this custom is not general, for in 90.1 per cent of the registered births considered the mother had a physician in attendance at birth and in only 9.3 per cent a midwife. The practice of the native mothers

differed considerably from that of the foreign-born, 98.9 per cent of the former having been attended by a physician and only 85.8 per cent of the latter.

Attendant at birth.	Births during selected year to—					
	All mothers.		Native mothers.		Foreign-born mothers.	
	Number.	Per cent distribution.	Number.	Per cent distribution.	Number.	Per cent distribution.
All classes.....	1,643	100.0	548	100.0	1,095	100.0
Physician.....	1,481	90.1	542	98.9	939	85.8
Midwife.....	153	9.3	4	.7	149	13.6
Other, none, or not reported.....	9	.5	2	.4	7	.6

The proportion of cases accredited to midwives is doubtless an understatement, as in cases of difficult labor the midwife frequently calls in a physician and the case is accredited to him.

It was seldom the custom of mothers to seek medical advice during pregnancy, and many of the poorer mothers, and especially of the foreign-born, resumed part or all of their customary duties within a few days after the birth of the baby. Nevertheless a considerable number even among this group did remain in bed at least a week or 10 days after childbirth, with the services either of a practical nurse or of a visiting nurse from some philanthropic organization, or at least under the care of members of the family. It was not at all uncommon for the husband to act as nurse, particularly among the French Canadians. In these families in some cases where there were no grown children the husband continued to relieve the mother of the heavy housework, such as scrubbing and washing, for a number of weeks after confinement.

ECONOMIC AND INDUSTRIAL FACTORS.

Babies born into the homes of unskilled workers where earnings are small face greater hazards than those in more fortunate circumstances. When the 1,564 live-born babies included in this study are grouped according to father's earnings, it is found that among the babies in the lowest-earnings group infant deaths are more than four times as frequent as in the highest-earnings group.

Another point which appears from a study of the findings is that gainful employment of the mother away from home was accompanied by a high infant mortality rate, higher even than that for all babies in the low-earnings groups.

Occupation of father.—The great majority of the babies included in this study had fathers who were engaged in occupations outside of professional, clerical, and mercantile groups; 725 of them were factory operatives. The majority of these, 442, were textile opera-

tives, but in all 597 babies had fathers employed in textile mills in some capacity, either as operatives or as laborers, teamsters, clerks, etc.

TABLE 24.

Occupation of father.	Infants born during selected year.									
	Total.	Whose fathers earned specified amount.								Not reported.
		Under \$450.	\$450 to \$549.	\$550 to \$649.	\$650 to \$849.	\$850 to \$1,049.	\$1,050 to \$1,249.	\$1,250 and over.	No earnings. ¹	
All occupations ²	1,643	225	274	297	426	199	72	105	24	21
Manufacturing and mechanical industries.....	1,086	181	214	212	291	98	34	33	13	10
Blacksmiths.....	7	2	2	.....	2	1	.....	.....	.....	.....
Boilermakers.....	8	.....	.....	4	3	1	.....	.....	.....	.....
Builders and contractors.....	9	.....	.....	2	1	3	2	1	.....	.....
Compositors, linotype operators, and pressmen.....	6	1	1	1	2	.....	1	.....	.....	.....
Electricians.....	12	.....	.....	1	1	5	1	1	.....	.....
Engineers and firemen.....	42	.....	2	8	26	1	.....	2	2	1
Factory operatives.....	725	154	165	145	161	48	26	11	10	5
Textile.....	442	121	129	87	78	11	4	1	7	4
Shoe.....	200	24	26	38	65	28	11	6	1	1
Cigar and tobacco.....	31	1	1	2	6	7	10	4	.....	.....
Other industries.....	52	8	9	18	12	2	1	.....	2	.....
Laborers, helpers, and apprentices.....	56	14	17	14	10	1	.....	.....	.....	.....
Machinists, millwrights, and toolmakers.....	34	.....	5	5	15	6	1	2	.....	.....
Manufacturers (officials and managers).....	17	.....	.....	.....	2	2	1	12	.....	.....
Shoemakers and cobblers.....	7	.....	2	.....	.....	2	.....	2	.....	1
Skilled mechanics, building trades.....	138	8	17	30	56	21	1	1	1	3
Tailors.....	10	.....	1	1	5	1	1	1	.....	.....
Other pursuits.....	15	2	2	1	4	6	.....	.....	.....	.....
Trade.....	240	15	24	41	57	39	15	43	2	4
Bankers, brokers, real estate and insurance agents.....	15	.....	.....	.....	.....	4	4	7	.....	.....
Commercial travelers and salesmen.....	67	2	3	12	17	17	4	10	.....	2
Deliverymen.....	56	4	10	18	21	2	1	.....	.....	.....
Laborers.....	13	6	3	1	3	.....	.....	.....	.....	.....
Retail and wholesale dealers (proprietors, officials, and managers).....	80	3	8	9	10	14	6	26	2	2
Other pursuits.....	9	.....	.....	1	6	2	.....	.....	.....	.....
Domestic and personal service.....	90	7	11	6	29	22	6	6	1	2
Barbers.....	19	.....	2	2	9	4	.....	2	.....	.....
Saloonkeepers and bartenders.....	29	2	2	3	3	13	2	3	.....	1
Servants.....	10	1	.....	.....	8	1	.....	.....	.....	.....
Other pursuits.....	32	4	7	1	9	4	4	1	1	1
Transportation.....	88	9	11	18	25	13	7	5	.....	.....
Chauffeurs, teamsters, and expressmen.....	35	5	8	11	8	2	.....	1	.....	.....
Conductors, motormen, and trainmen.....	27	.....	1	4	11	6	2	3	.....	.....
Express, post, telegraph, and telephone employees.....	6	.....	.....	.....	1	.....	5	.....	.....	.....
Laborers.....	13	4	2	3	3	1	.....	.....	.....	.....
Proprietors, officials, and managers.....	3	.....	.....	.....	.....	2	.....	1	.....	.....
Other pursuits.....	4	.....	.....	.....	2	2	.....	.....	.....	.....

¹ Includes 1 father living on his income.

² Of 597 fathers in the textile industry 442 were operatives and 155 employees engaged in occupations not peculiar to the industry, such as officials, clerks, carpenters, teamsters, etc. The latter were classified in the occupational groups to which they belong.

TABLE 24—Continued. Occupation of father.	Infants born during selected year.									
	Total.	Whose fathers earned specified amount.								
		Under \$450.	\$450 to \$549.	\$550 to \$649.	\$650 to \$849.	\$850 to \$1,049.	\$1,050 to \$1,249.	\$1,250 and over.	No earnings.	Not reported.
Clerical occupations, all industries.....	39	1	1	8	15	9	1	4	.....	.....
Public service.....	33	4	6	7	4	7	2	2	.....	1
Laborers.....	22	4	6	7	4	.....	.....	.....	.....	1
Officials, firemen, and policemen.....	11	.....	.....	.....	.....	7	2	2	.....	.....
Professional and semiprofessional pursuits.....	27	1	.....	1	2	5	6	11	.....	1
Agriculture and forestry.....	20	2	4	4	3	4	.....	1	.....	2
Farmers.....	8	1	.....	1	1	3	.....	1	.....	1
Farm laborers.....	10	1	4	2	2	1	.....	.....	.....	.....
Others.....	2	.....	.....	1	.....	.....	.....	.....	.....	1
No occupation ¹	7	.....	.....	.....	.....	.....	.....	.....	7	.....
Not reported.....	13	5	3	.....	.....	2	1	.....	1	1

¹ Includes 1 father living on his income.

Father's earnings an index of economic status.—The father's earnings, it is believed, furnish the most reliable index to the economic status of the family because in most cases they are not only the chief support but also the most stable and regular element in the family income. Supplementary sources of income such as mother's and children's earnings are likely to be temporary and fluctuating. A special objection to lumping father's earnings with the earnings of the mother and children is that the gainful employment of the latter indicates a low economic status which would tend to be obscured were their earnings combined. Furthermore, the increase in family income due to mother's going to work is one brought about by creating a possible factor in infant mortality, namely, the withdrawal of the mother's care. Income derived from property is found chiefly in the group of fathers earning \$1,250 or more, all of whom are classed together in any event. The father's earnings therefore best represent the scale of living attainable through a period of years and fix the living habits and the real economic status of the family.

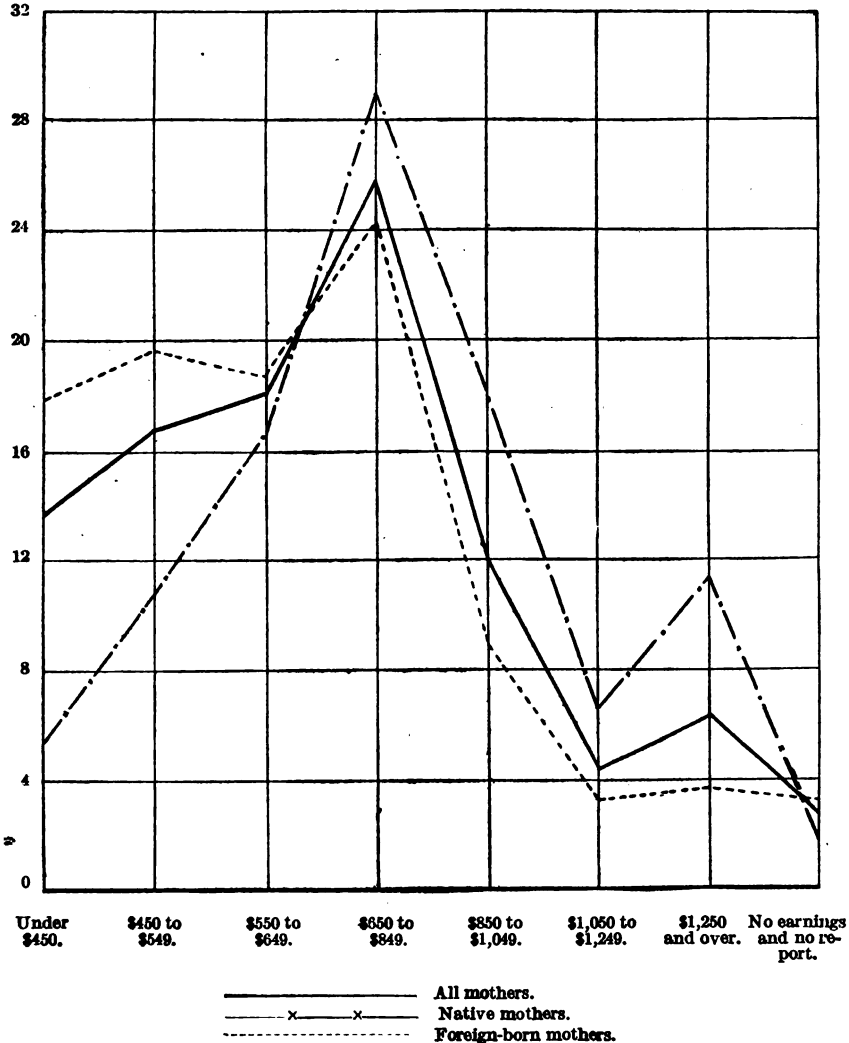
Rates of pay can not be computed from the earnings reported. On account of lack of employment or for other reasons the father may not have worked steadily. It can not be inferred, because a father earned, for example, only \$350 in a year's time that his unit rate was so low that he could not have earned more if at work full time throughout the year.

Distribution of economic groups.—A classification of babies on the basis of father's earnings shows that the fathers of 48.4 per cent, or

nearly half of them, earned less than \$650 a year and that the fathers of 74.4 per cent, approximately three-fourths, earned under \$850. Only 6.4 per cent had fathers earning \$1,250 or more, while 225, or 13.7 per cent of the whole number, had fathers who earned less than \$450. In addition to those for whom earnings were reported the fathers of 23 babies either had died or, during the year following the child's birth, did not contribute to the support of their families because they had deserted or had earned nothing on account of illness. In the case of 21 babies the father's earnings could not be ascertained. (See Table 25.)

DIAGRAM IV.—PER CENT OF BIRTHS TO ALL MOTHERS, NATIVE MOTHERS AND FOREIGN-BORN MOTHERS, ACCORDING TO FATHER'S EARNINGS.

PER CENT.



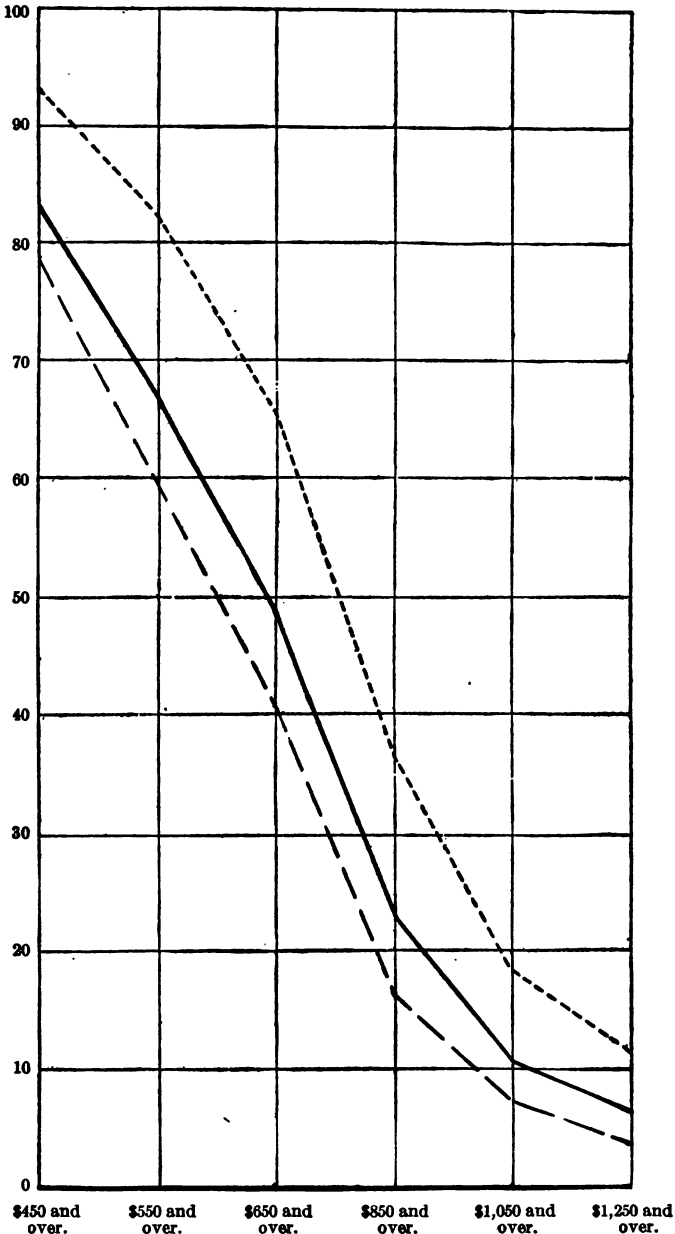
Earnings of father.	Births during selected year to—					
	All mothers.		Native mothers.		Foreign-born mothers.	
	Number.	Per cent distribution.	Number.	Per cent distribution.	Number.	Per cent distribution.
All classes.....	1,643	100.0	548	100.0	1,095	100.0
Under \$450.....	225	13.7	29	5.3	196	17.9
\$450 to \$549.....	274	16.7	59	10.8	215	19.6
\$550 to \$649.....	297	18.1	92	16.8	205	18.7
\$650 to \$849.....	426	25.9	160	29.2	266	24.3
\$850 to \$1,049.....	199	12.1	100	18.2	99	9.0
\$1,050 to \$1,249.....	72	4.4	36	6.6	36	3.3
\$1,250 and over.....	105	6.4	63	11.5	42	3.8
No earnings ¹	24	1.5	5	.9	19	1.7
Not reported.....	21	1.3	4	.7	17	1.6

¹ Includes 1 father living on his income.

The same economic facts shown in the preceding table and diagram are presented in a somewhat different form in the next diagram, which shows cumulative groups by father's earnings—that is, those earning a specified amount and over.

DIAGRAM V.—PER CENT OF BIRTHS TO ALL MOTHERS, NATIVE MOTHERS, AND FOREIGN-BORN MOTHERS IN GROUPS WHERE FATHERS EARNED SPECIFIED AMOUNTS AND OVER.

PER CENT.



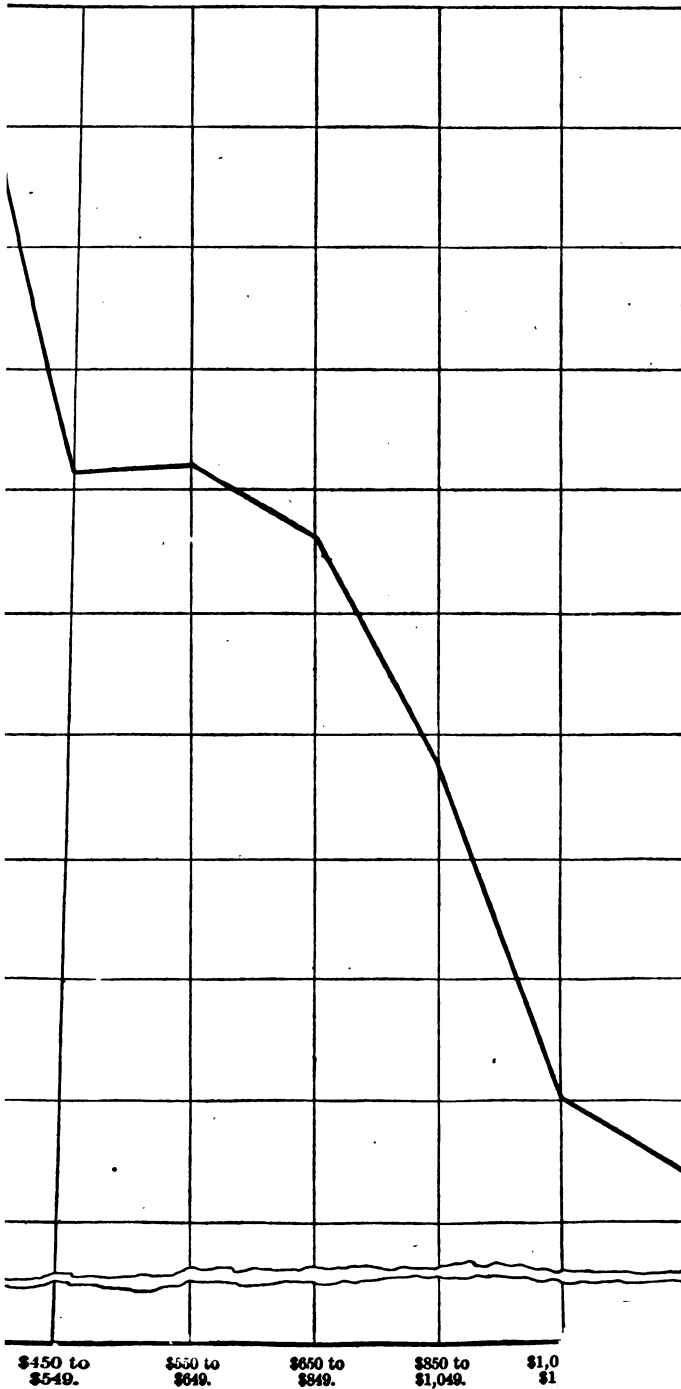
Earnings of father.	Percentage of births to—		
	All mothers.	Native mothers.	Foreign-born mothers.
\$450 and over.....	83.6	93.1	78.8
\$550 and over.....	66.9	82.3	59.2
\$650 and over.....	48.8	65.5	40.5
\$850 and over.....	22.9	36.3	16.2
\$1,050 and over.....	10.8	18.1	7.1
\$1,250 and over.....	6.4	11.5	3.8

————— All mothers.
 - - - - - Native mothers.
 - . - . - Foreign-born mothers.

* Includes other living on his income.

Following diagram graphically illustrates the constancy with infant death rates fall as earnings rise.

DIAGRAM VI.—INFANT MORTALITY RATE BY FATHER'S EARNINGS.



Father's earnings supplemented.—The families of 924 babies, 56.2 per cent of the whole number, had other sources of income than the father's earnings. Supplementary income derived from earnings of mother and children occurred more frequently, as might be expected, where the father's earnings were low than in the class with higher earnings, for low earnings of the father often necessitate gainful employment of other members of the family. Mother's earnings where derived from boarders or lodgers were reported gross—that is, as the total receipts from these sources. Actual net profit from real estate could never be ascertained, and rentals, therefore, were always reported gross. The data on total income, it will be seen, are much less reliable than those regarding father's earnings on account of the difficulty in general of ascertaining the facts in regard to such income, and in particular of separating net income from gross.

Total income.—Though the information obtained on total family income is not wholly accurate, the indications are that in the group of families studied in Manchester supplementary sources of income, where they existed, were of much less importance in determining the family's economic standing than was the father's contribution. In the group where the father's earnings were under \$550 per annum other sources of income existed in 76 per cent of the cases, and only 95, or 25.1 per cent, of 379 such families had their whole income brought up to \$850 or more. Where the father's earnings were from \$550 to \$649 per annum the families of 55.2 per cent of the babies had other sources of income, but less than half of those reporting other income had a total annual income of more than \$850. The relative importance of other sources of income continues to grow less as the father's earnings increase.

TABLE 27.

Total family income.	Infants born during selected year.							
	Total.		Whose fathers earned specified amount.					
			Under \$550.		\$550 to \$649.		\$650 to \$849.	
	Num- ber.	Per cent distrib- ution.	Num- ber.	Per cent distrib- ution.	Num- ber.	Per cent distrib- ution.	Num- ber.	Per cent distrib- ution.
All classes.....	1,643	100.0	499	100.0	297	100.0	426	100.0
Own income.....	1	.1						
Income from father's earnings only.....	718	43.7	120	24.0	133	44.8	212	49.8
Income including more than father's earnings.....	924	56.2	379	76.0	164	55.2	214	50.2
Under \$550.....	81	4.9	68	13.6				
\$550 to \$649.....	102	6.2	83	16.6	16	5.4		
\$650 to \$849.....	245	14.9	117	23.4	66	22.2	61	14.3
\$850 to \$1,049.....	199	12.1	59	11.8	35	11.8	81	19.0
\$1,050 to \$1,249.....	95	5.8	14	2.8	17	5.7	37	8.7
\$1,250 and over.....	149	9.1	22	4.4	22	7.4	30	7.0
Not reported.....	53	3.2	16	3.2	8	2.7	5	1.2

TABLE 27—Continued.

Total family income.	Infants born during selected year—Continued.							
	Whose fathers earned specified amount—Continued.							
	\$850 to \$1,049.		\$1,050 to \$1,249.		\$1,250 and over.		No earnings.	
	Num-ber.	Percent distri-bution.	Num-ber.	Percent distri-bution.	Num-ber.	Percent distri-bution.	Num-ber.	Percent distri-bution.
All classes.....	199	100.0	72	100.0	105	100.0	24	100.0
Own income.....								
Income from father's earnings only.....	119	59.8	55	76.4	75	71.4	1	4.2
Income including more than father's earnings.....	80	40.2	17	23.6	30	28.6	23	95.8
Under \$550.....							13	54.2
\$550 to \$649.....							3	12.5
\$650 to \$849.....							1	4.2
\$850 to \$1,049.....	21	10.6					3	12.5
\$1,050 to \$1,249.....	25	12.6	2	2.8				
\$1,250 and over.....	30	15.1	15	20.8	30	28.6		
Not reported.....	4	2.0					3	12.5

Father's earnings and employment of mother.—Gainful employment of the mother, in so far as it accompanies low earnings of the father, would naturally be associated with a high infant mortality rate. It may act independently, however, and either add to the disadvantages which the baby suffers on account of poverty or mitigate them according to whether the loss of the mother's care, which it involves, is offset or not by the added income. But in general the babies of working mothers in Manchester had a higher infant mortality rate than babies whose mothers were not gainfully employed.

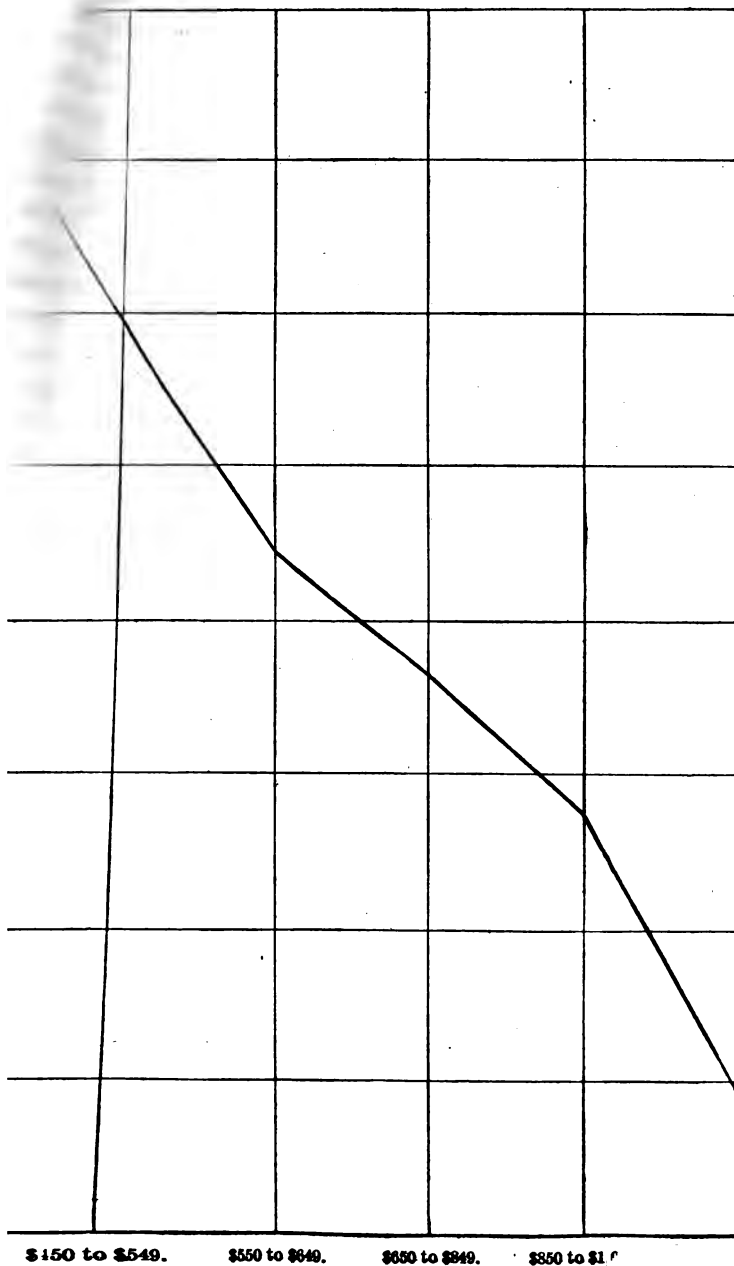
It has been often alleged that in industrial communities such as Manchester, which offer ready employment for women, the reason married women and mothers seek gainful employment is either because of the temptation to earn pin money or money for some special purpose such as the buying of a home or because women learn economic independence before marriage and prefer the factory to housework. Individual instances of this sort were encountered in Manchester, but insufficient or low earnings on the part of the father appear to be the most potent reason for the mother's going to work. Where the fathers earned less than \$450 a year 73.3 per cent of the mothers were gainfully employed during some part of the year after the baby's birth. With each rise in economic status the proportion of babies with mothers gainfully employed falls but does not really reach a small proportion, 9.6 per cent, until the group with fathers earning \$1,050 and over a year is reached. These proportions, however, are markedly different among the native and the foreign born, particularly those other than French Canadians. (See Table 28.)

Of the 722 babies whose mothers were gainfully employed the year after childbirth 45.4 per cent were in families where the earnings of



Some time during the year following childbirth shows relation between the gainful employment of mothers and earnings of fathers.

PER CENT OF MOTHERS GAINFULLY EMPLOYED DURING YEAR FOLLOWING BIRTH WHEN FATHERS EARNED SPECIFIED AMOUNTS.



1

2

3

4

Not reported

Other income

Under \$450
\$450 to \$549
\$550 to \$649
\$650 to \$749
\$750 to \$1,049
\$1,050 to \$1,749
\$1,750 and over
No information
Not reported

1. Income

From the
From the

Babies of mothers gainfully employed during the year preceding the baby's birth had a mortality rate of 199.2, whereas the rate for babies of mothers who were not so employed was 133.9. The rate for babies of mothers whose gainful work was in the home was 149.8; for babies whose mothers worked away from home, 227.5. This latter rate is somewhat lower than the rate of 242.9 reported for babies in the lowest economic class—those whose fathers earned under \$450 per annum. However, the total number of live-born babies whose mothers worked during the year previous to childbirth was 733, while the number whose fathers earned under \$450 was only 210. In order to compare groups containing the largest possible number of coincidences between low earnings and mother's work it is necessary to consider all live-born babies whose fathers' earnings were under \$650 per annum. These babies numbered 750, and the infant mortality rate was 193.3, which is appreciably lower than the one quoted above for babies whose mothers were gainfully employed away from home the year previous to childbirth. The influence upon stillbirths of mother's work before the birth of her child has been shown already in the discussion of that topic on page 31.

TABLE 31. Employment of mother at home and away from home during year before baby's birth and nativity of mother.	Births during selected year and infant deaths.					
	Total births.	Live births.			Stillbirths.	
		Total.	Infant deaths.		Number.	Per cent. ¹
			Number.	Infant mortality rate. ¹		
All mothers.....	1,643	1,564	258	165.0	79	4.8
Not gainfully employed.....	864	829	111	133.9	35	4.1
Gainfully employed.....	776	733	146	199.2	43	5.5
At home.....	272	267	40	149.8	5	1.8
Away from home.....	504	466	106	227.5	38	7.5
Not reported.....	3	2	1	.....	1	.....
Native mothers.....	548	523	67	128.1	25	4.6
Not gainfully employed.....	352	338	31	91.7	14	4.0
Gainfully employed.....	194	183	35	191.3	11	5.7
At home.....	58	58	7	.....	.....	.....
Away from home.....	136	125	28	224.0	11	8.1
Not reported.....	2	2	1	.....	.....	.....
Foreign-born mothers.....	1,065	1,041	191	183.5	54	4.9
Not gainfully employed.....	512	491	80	162.9	21	4.1
Gainfully employed.....	552	550	111	201.8	32	5.5
At home.....	214	209	33	157.9	5	2.3
Away from home.....	368	341	78	228.7	27	7.3
Not reported.....	1	.....	.....	.....	1	.....
French-Canadian mothers.....	610	574	129	224.7	36	5.9
Not gainfully employed.....	349	335	66	197.0	14	4.0
Gainfully employed.....	261	239	63	263.6	22	8.4
At home.....	75	73	14	.....	2	.....
Away from home.....	186	166	49	295.2	20	10.8
Other foreign-born mothers.....	485	467	62	132.8	18	3.7
Not gainfully employed.....	163	156	14	89.7	7	4.3
Gainfully employed.....	321	311	48	154.3	10	3.1
At home.....	139	136	19	139.7	3	2.2
Away from home.....	182	175	29	165.7	7	3.8
Not reported.....	1	.....	.....	.....	1	.....

¹ Not shown where base is less than 100.

Work during year after baby's birth.—It remains to be demonstrated whether or not the gainful employment of the mother during some part of the year following childbirth is an independent factor in the infant mortality rate. The mothers of 679 live-born infants were thus employed; among these infants occurred 150 deaths under 12 months of age. The infant mortality rate, therefore, for this group is 220.9 as compared with a rate of 122 for the babies whose mothers were not gainfully employed during any part of the year following childbirth. At first glance the wide difference between these rates seems conclusive evidence of the effect of the mother's gainful employment upon the well-being of the child. Several points, however, which weaken the comparative value of these rates must be considered.

In the first place, the group of gainfully employed mothers is composed of two widely different elements—those who worked at home and were not separated from their babies and those who worked away from home and were separated from their babies. Secondly, the mothers of 72 babies were not gainfully employed until after their babies had died. In no way, therefore, could the employment of these mothers have been a factor in their babies' deaths.

Employment of mother at home and away from home during year following baby's birth and baby's age when mother resumed gainful work away from home.	Live births during selected year and infant deaths.			
	Total live births.	Survived 1 year.	Infant deaths.	
			Number.	Infant mortality rate. ¹
All mothers.....	1,564	1,306	258	165.0
Not gainfully employed.....	885	777	108	122.0
Gainfully employed.....	679	529	150	220.9
Resumed after baby's death.....	72	.....	72	.....
Resumed during baby's life.....	603	529	74	122.7
No report of time resumed.....	4	.....	4	.....
Work at home.....	353	305	48	136.0
Resumed after baby's death.....	13	.....	13	.....
Resumed during baby's life.....	336	305	31	92.3
No report of time resumed.....	4	.....	4	.....
Work away from home.....	326	224	102	312.9
Resumed after baby's death.....	59	.....	59	.....
Resumed during baby's life.....	267	224	43	161.0
Baby's age when resumed:				
Under 1 month.....	11	6	5	.....
1 month and under 2.....	34	22	12	.....
2 months and under 3.....	42	37	5	.....
3 months and under 4.....	32	21	11	.....
4 months and under 5.....	22	18	4	.....
5 months and under 6.....	31	28	3	.....
6 months or older.....	95	92	3	.....

¹ Not shown where base is less than 100.

If the 72 babies just referred to and the 4 whose ages when the mothers resumed work were not reported be eliminated from consideration, the infant mortality rate for the 603 babies whose mothers were gainfully employed while their babies were still alive is 122.7—a rate

almost identical with that for babies whose mothers were not gainfully employed.

The rate of 122.7 is made up of two rates—one of 92.3 for the babies whose mothers were gainfully employed at home during the baby's lifetime and one of 161 for those whose mothers were thus employed away from home. Evidently employment of the latter sort is the one, if either, to be considered a factor in infant mortality.

A careful examination of the original schedules discloses the fact that of the mothers who were gainfully employed outside the home while their babies were still alive not one was thus employed before the baby was at least 2 weeks old. The mortality rate, 161 for the babies of these mothers, is therefore a rate for a selected group of babies who survived at least 2 weeks and should be compared with the rate for the remaining babies who survived at least 2 weeks. In all, 1,508 infants survived at least 2 weeks—267 whose mothers went out to work while their babies were alive and 1,241 others. In this latter group occurred 159 subsequent infant deaths—a mortality rate of 128.1, which is markedly lower than the rate of 161 for the babies whose mothers were gainfully employed outside the home during the baby's lifetime.

Significance of mother's absence.—The evil effects of the mother's gainful employment away from home while the baby is alive lie primarily in depriving the child of the mother's care and in substituting artificial feeding for breast feeding. The younger the baby the more marked the effect. Of the 119 babies whose mothers worked away from home before the baby was 4 months of age, 33 died before the age of 1 year. The mortality rate was 277.3. Among all other live-born babies, 1,445 in number, there occurred 225 infant deaths—a mortality rate of 155.7. But since the 119 babies were part of a selected group which had survived at least 2 weeks, the full significance of the rate, 277.3, appears only when contrasted with the rate of 121.7 for the remainder of the group, namely, 1,389 babies who had survived at least 2 weeks. (See Table 33.)

Clearly, from these comparisons, so far as our data revealed the actual conditions in Manchester, the gainful employment of mothers away from home during some part of the year following childbirth was accompanied by a marked increase in the infant mortality rate, particularly in those cases where the mothers were thus employed within four months of childbirth.



III

... year following

NATIVITY AND NATIONALITY.

Foreign element in city.—Manchester has a large foreign-born population in which the French-Canadian is the dominant group. The total population in 1910 according to the Federal census was 70,063, of which 29,692, or 42 per cent, were foreign-born white; 24,197, or 35 per cent, native white of foreign or mixed parentage, and only 16,119, or 23 per cent, native white of native parents. The French-Canadian was not far below the native stock, numbering 13,720, or 20 per cent of the total. Other foreign born found in any considerable numbers in 1910 were the Irish, 3,482; Canadians (other than French), 2,716; Germans, 1,225; and Greeks, 1,330. The last named and the Poles and Syrians are the newest immigrants and appear to be coming in increasing numbers.

The reports¹ of the Immigration Commission give the following account of the history of immigration to Manchester:

The character of the immigration to Manchester, N. H., like that of other cotton-manufacturing cities, has undergone considerable change within the past 20 years. Practically no Irish have come during that time, the English and Germans ceased to come in considerable numbers during the same period, and comparatively few French Canadians have arrived since the cessation of their enormous immigration 10 or 15 years ago.

The Irish immigration was very heavy after 1850 and again after 1870. They form at present by far the largest group of foreign-born, exclusive of Canadians. * * * French-Canadian immigration, beginning in large numbers in the late seventies and in the early part of the decade 1880-1890, has contributed by far the most important element of the foreign population. In 1900, 55 per cent of the foreign-born of Manchester were French Canadians, their number, even exclusive of the second generation, representing almost one-fourth of the total population of the city. * * *

The more recent immigrants, at present so important a factor in the mill population, began coming to Manchester 12 or 15 years ago. The Poles first entered the mills of the city about 1895, and are still arriving in considerable numbers. The Greeks and Bulgarians, together with a few Syrians and Turks, constitute the largest racial group now coming to the city.

Foreign-born mothers in this study.—Although the foreign born constituted only about 42 per cent of the total population, foreign-born mothers gave birth to about 67 per cent of the 1,643 infants.

Over half of the mothers of foreign birth were French Canadians. The number of births to this group was 610, or 37.1 per cent of the total. Polish mothers were next in numbers, giving birth to 170 children. Irish mothers contributed 92 births; Greek and Syrian, 72.

The last two races named live in the same colonies and have much the same habits; therefore they were combined for purposes of comparison. The same is true also of Ruthenian, Lithuanian, and Polish, and the number of births to this whole group was 192. English, Irish, and Scotch combined contributed 115 births. Other nationalities were less important in numbers. (See Table 15.)

¹ Reports of the Immigration Commission, vol. 10, p. 46, Washington, 1911.

French Canadians.—The French Canadians in Manchester form a prominent and distinct element in the city life. They have an intense feeling of nationality, shared even by their descendants of the first and second generations. Their impress upon the city is to be seen in the French names of many institutions, such as churches, convents, schools, hospitals, orphanages, and homes. Many of the streets in the predominantly French section bear French names, as, for example, Notre Dame, Cartier, Dubuque, Youville, Alsace, etc. French is the common language of the home, shop, and street in this section, and even the stores in the principal business sections employ French interpreters to receive customers' orders. There is one French daily newspaper in the city. It is significant that the only native mothers encountered in connection with this study who could not speak English were of French-Canadian descent; they numbered 42, or 7.7 per cent of the total native born.

The French Canadians in Manchester are generally thrifty, self-respecting people, ambitious to own their homes and to accumulate property. Despite their tendency to retain their language and a separate community life, they are found not only in the French quarter but in other sections of the city. They are also found in all occupations, though large numbers work in the textile mills. Their earnings here are higher as a rule than those of the newer immigrants, the Greeks, Syrians, and Poles, and on the whole they occupy a relatively favorable position among the foreign-born population in the community as regards both economic and social status.

Nationality and infant mortality.—The infant mortality rate among babies of native mothers was 128.1, while among babies of foreign-born mothers it was 183.5. The rate for babies born to French-Canadian mothers was 224.7, and the next highest rate was that among babies of Polish mothers—189. The lowest rate shown is that for babies of the English, Irish, and Scotch mothers; for this group it was only 66, a rate very much lower than that for babies of native mothers. These figures make apparent the disproportionately large number of deaths among babies born to French-Canadian mothers. There were 129 deaths in this group, and if these be eliminated the infant mortality rate for all other foreign-nationality groups combined falls from 183.5 to 132.8, and the rate for all babies considered from 165 to 130.3. (See Table 15.)

Economic status and size of family.—A larger proportion of the foreign-born mothers than of the native are found in the economic groups where father's earnings are lowest, and this difference in economic status is even more marked when the size of family is considered. In general the native born have larger earnings and smaller families than the foreign born. In the group of babies in which the fathers earned under \$650, of those with native mothers 15 per cent were in families of over four persons, while of babies with other foreign

mothers 28.4 per cent and of babies with French-Canadian mothers 42.5 per cent, were in such families. Similarly, among all with fathers earning under \$850 the percentages of the same three groups in families of more than four persons were 19.7, 30.8, and 41, respectively. Only 11 babies of native mothers were born in families of more than eight persons and two of these were in the earnings group under \$650. Of the babies born to foreign mothers 74 were in families of over eight persons, and 44 of these were in this low-income group.

TABLE 35.

Earnings of father and nativity of mother.	Average number ¹ of persons per family.	Births during selected year in—					
		All families.	Families of specified number ¹ of persons.				No report.
			1 to 4.		Over 4.		
			Num-ber.	Per-cent.	Num-ber.	Per-cent.	
All mothers.....	4.0	1,643	1,132	68.9	510	31.0	1
Under \$450.....	3.8	225	163	72.4	62	27.6	
\$450 to \$549.....	4.2	274	183	66.8	91	33.2	
\$550 to \$649.....	3.9	297	205	69.0	92	31.0	
\$650 to \$849.....	4.1	426	283	66.4	143	33.6	
\$850 to \$1,049.....	3.9	199	144	72.4	55	27.6	
\$1,050 to \$1,249.....	4.2	72	48	66.7	24	33.3	
\$1,250 and over.....	3.6	105	78	74.3	27	25.7	
No earnings ²	3.6	24	16	66.7	7	29.2	1
Not reported.....	4.2	21	12	57.1	9	42.9	
Native mothers.....	3.3	548	444	81.0	103	18.8	1
Under \$450.....	3.4	29	24	82.8	5	17.2	
\$450 to \$549.....	3.2	59	51	86.4	8	13.6	
\$550 to \$649.....	3.1	92	78	84.8	14	15.2	
\$650 to \$849.....	3.7	160	120	75.0	40	25.0	
\$850 to \$1,049.....	3.3	100	83	83.0	17	17.0	
\$1,050 to \$1,249.....	3.3	36	30	83.3	6	16.7	
\$1,250 and over.....	3.2	63	52	82.5	11	17.5	
No earnings ²	1.0	5	4	80.0			1
Not reported.....	3.8	4	2	50.0	2	50.0	
Foreign-born mothers.....	4.3	1,095	688	62.8	407	37.2	
Under \$450.....	3.8	196	139	70.9	57	29.1	
\$450 to \$549.....	4.5	215	132	61.4	83	38.6	
\$550 to \$649.....	4.3	205	127	62.0	78	38.0	
\$650 to \$849.....	4.4	266	163	61.3	103	38.7	
\$850 to \$1,049.....	4.5	99	61	61.6	38	38.4	
\$1,050 to \$1,249.....	5.1	36	18	50.0	18	50.0	
\$1,250 and over.....	4.1	42	26	61.9	16	38.1	
No earnings ²	4.2	19	12	63.2	7	36.8	
Not reported.....	4.3	17	10	58.8	7	41.2	
French-Canadian mothers.....	4.6	610	355	58.2	255	41.8	
Under \$450.....	4.3	52	32	61.5	20	38.5	
\$450 to \$549.....	5.0	121	65	53.7	56	46.3	
\$550 to \$649.....	4.6	133	79	59.4	54	40.6	
\$650 to \$849.....	4.4	177	109	61.6	68	38.4	
\$850 to \$1,049.....	4.8	68	39	57.4	29	42.6	
\$1,050 to \$1,249.....	6.0	18	6	33.3	12	66.7	
\$1,250 and over.....	4.4	22	13	59.1	9	40.9	
No earnings ²	3.4	10	7	70.0	3	30.0	
Not reported.....	4.7	9	5	55.6	4	44.4	
Other foreign-born mothers.....	3.9	485	333	68.7	152	31.3	
Under \$450.....	3.7	144	107	74.3	37	25.7	
\$450 to \$549.....	3.8	94	67	71.3	27	28.7	
\$550 to \$649.....	3.9	72	48	66.7	24	33.3	
\$650 to \$849.....	4.4	89	54	60.7	35	39.3	
\$850 to \$1,049.....	3.9	31	22	71.0	9	29.0	
\$1,050 to \$1,249.....	4.2	18	12	66.7	6	33.3	
\$1,250 and over.....	3.8	20	13	65.0	7	35.0	
No earnings ²	5.0	9	5	55.6	4	44.4	
Not reported.....	3.9	8	5	62.5	3	37.5	

¹ Baby born during selected year not included in number.

² Includes 1 father living on his income.

Economic status of French Canadians and others.—The high infant mortality rates found among foreign born are accompanied in general by low earnings of the father. Among the French Canadians, however, the father's earnings were in general higher than among other foreign born. For example, of the births to French-Canadian mothers only 8.5 per cent occurred in the economic class where the father's earnings were less than \$450, while of the births to other foreign mothers 29.7 per cent were in this class. Half of the babies of French-Canadian mothers belonged to families where the father's earnings were less than \$650, but practically two-thirds of the babies of other foreign-born mothers belonged to such families. The infant death rates among both the French Canadians and the other foreign born show in general a decline with rise in father's earnings, but the death rates for the babies of French-Canadian mothers within each economic class are higher than the rates for others in the same class.

Employment of foreign-born mothers.—A classification of the babies born to French-Canadian mothers and to other foreign-born mothers on the basis of gainful employment of the mother the year after childbirth and according to father's earnings reveals a smaller extent of gainful employment among French-Canadian mothers. Of the whole number of babies of French-Canadian mothers, 41.5 per cent had mothers who worked the year following childbirth as compared with 62.3 per cent of the babies of other foreign mothers who worked during this period. In the lowest economic class, where the father's earnings were less than \$450 per annum, the percentage of babies whose mothers worked the year following childbirth was 55.8 in the French-Canadian group and 83.3 in the group of other foreign-born. Though the proportion of mothers gainfully employed declines in both groups, generally with the rise of father's earnings the proportion of mothers who work is less among the French Canadians than among the other foreign born. (See Table 28.)

Gainful employment of the mothers during the year preceding childbirth is also found to a less extent among the French-Canadian mothers. Of the births to French-Canadian mothers 42.8 per cent were to mothers who had worked the year previous to confinement, while 66.2 per cent of the births to other foreign-born mothers were to mothers who had worked in this year. (See Table 31.)

The infant mortality rate, as has been shown, in general is higher among babies of mothers gainfully employed than among babies of mothers not so employed. The contrast between those whose mothers work away from home and others is particularly marked, but in all cases the babies of French-Canadian mothers die at a much higher rate than babies of other foreign-born mothers.

then the smaller extent of gainful employment among Canadian mothers and the higher economic status of the interbalanced in part, it is true; by the larger size, rates in all subclasses compared are so much higher as of French-Canadian mothers than among babies of foreign-born mothers that a much higher rate for the French group as a whole is obtained.

Speak English.—Among the foreign born inability to speak English is generally regarded as a handicap which puts them at a disadvantage economically and socially and so tends toward a lower standard of living. It usually indicates a lack of means for the knowledge of the proper care of the baby and of the medical resources of the community as a whole, in that the non-English born are more or less limited in their choice of doctors and nurses; the social, medical, and educational resources of the community; these conditions do not operate equally regardless of race; in Manchester lack of a knowledge of English would be less disadvantageous to the French Canadians than to the English; the former are such a definitely independent element in the population.

Ability to speak English.	Births during selected year and infant deaths.					
	Total births.	Live births.			Stillbirths.	
		Total.	Infant deaths.		Number.	Per cent. ¹
			Number.	Infant mortality rate. ¹		
.....	1,643	1,564	258	165.0	79	4.8
Irish.....	975	922	126	136.7	53	5.4
English.....	667	641	132	205.9	26	3.9
.....	1	1	.....	.....	.....	.....
foreign-born mothers.....	1,095	1,041	191	183.5	54	4.9
nationalities.....	129	120	9	75.0	9	7.0
including nationalities.....	966	921	182	197.6	45	4.7
English.....	341	321	60	186.9	20	5.9
non-English.....	625	600	122	203.3	25	4.0
Canadian mothers.....	610	574	129	224.7	36	5.9
Speak English.....	249	231	50	216.5	18	7.2
Do not speak English.....	361	343	79	230.3	18	5.0
Foreign-born mothers.....	356	347	53	152.7	9	2.5
Speak English.....	92	90	10	.....	2	.....
Do not speak English.....	264	257	43	167.3	7	2.7

¹ Not shown where base is less than 100.

² Includes 42 native mothers.

³ English, Irish, Scotch, and Canadian except French.

ation of foreign-born mothers of non-English speaking according to ability to speak English reveals the fact

that the French-Canadian mothers, who are longer resident in this country than other foreign-born mothers, had acquired the language to a greater degree than the others. Of the 610 babies born to French-Canadian mothers 249, or 40.8 per cent, had mothers able to speak English, while of the babies of other non-English speaking foreign-born mothers but 92, or 25.8 per cent, had such mothers. Forty-two native mothers spoke French only.

The rate among babies of all mothers (native and foreign-born) able to speak English was 136.7, while that of babies whose mothers could not speak the language was 205.9. The infant death rate for babies of both French-Canadian and other non-English speaking foreign-born mothers was higher where the mother could not speak English than where she could.

Years in United States.—The infant death rate for babies of all foreign-born mothers who had been in this country 5 years or less was 248.8, while that for babies of mothers who had lived here over 5 years was 165.7. On the other hand, the French-Canadian, among whom the highest infant death rate was found, was the foreign group which had been in this country longest. Only 14.9 per cent of all babies of French-Canadian mothers were born to those who had lived in the United States 5 years or less; whereas 27.5 per cent of babies of other foreign-born mothers were born to those who had lived in the United States for that period. Nearly half of the French-Canadian mothers had been in this country over 15 years. The infant death rate was higher, however, among the more recently arrived French Canadians than among those who had been in the United States for 12 years or more.

United States.	Births during selected year to foreign-born mothers and infant deaths.					
	Total births.	Live births.			Stillbirths.	
		Total.	Infant deaths.		Number.	Per cent. ¹
			Number.	Infant mortality rate. ¹		
Foreign-born mothers.....	1,095	1,041	191	183.5	54	4.9
.....	44	43	9	.....	1	.....
.....	180	174	45	258.6	6	3.3
.....	165	160	24	150.0	5	3.0
.....	138	132	29	219.7	6	4.3
.....	183	176	24	136.4	7	3.8
.....	381	353	59	167.1	28	7.3
.....	4	3	1	.....	1	.....
Canadian mothers.....	610	574	129	224.7	36	5.9
.....	14	13	5	.....	1	.....
.....	77	74	24	.....	3	.....
.....	68	65	14	.....	3	.....
.....	55	52	16	.....	3	.....
.....	108	103	19	184.5	5	4.6
.....	285	265	50	188.7	20	7.0
.....	3	2	1	.....	1	.....
Sign-born mothers.....	485	467	62	132.8	18	3.7
.....	30	30	4	.....	.....	.....
.....	103	100	21	210.0	3	2.9
.....	97	95	10	.....	2	.....
.....	83	80	13	.....	3	.....
.....	75	73	5	.....	2	.....
.....	96	88	9	.....	8	.....
.....	1	1	.....	.....	.....	.....

¹ Not shown where base is less than 100.

Nationality of mother.	Births during selected year to foreign-born mothers.							
	Total.	In United States specified number of years.						
		Under 3.	3 to 5.	6 to 8.	9 to 11.	12 to 15.	16 and over.	Not reported.
Foreign-born mothers.....	1,095	44	180	165	138	183	381	4
.....	610	14	77	68	55	108	285	3
.....	170	7	41	51	39	24	8	.....
Scotch.....	115	1	7	11	17	27	52	.....
.....	72	14	37	12	8	1	.....	.....
.....	127	8	18	23	19	23	35	1
.....	1	.....	.....	.....	.....	.....	1	.....

PER CENT DISTRIBUTION.

Foreign-born mothers.....	100.0	4.0	16.4	15.1	12.6	16.7	34.8	0.4
.....	100.0	2.3	12.6	11.1	9.0	17.7	46.7	.5
.....	100.0	4.1	24.1	30.0	22.9	14.1	4.7	.....
Scotch.....	100.0	.9	6.1	9.6	14.8	23.5	45.2	.....
.....	100.0	19.4	51.4	16.7	11.1	1.4	.....	.....
.....	100.0	6.3	14.2	18.1	15.0	18.1	27.6	.8

Literacy.—Literacy in Manchester showed almost as close a relation to foreign birth as ability to speak English, for out of a total of 286 babies born to mothers who were illiterate only 25 were babies of native mothers. In the case of literacy again a peculiar situation exists with reference to the French Canadians, for although illiteracy in general is accompanied by a high infant death rate, in the French-Canadian group the infant death rate for all babies was 224.7, and for babies of literate mothers the rate was practically identical, namely 223.3. The difference in the infant mortality rates on the basis of the literacy of mothers was chiefly confined to the group of other foreign born. Here the rate was only 94.6 for babies of literate mothers but rose to 198.8 for babies of illiterate mothers. The French-Canadian mothers were more generally literate than the other foreign-born mothers, 85.9 per cent being so classed as compared with 63.9 per cent of the other foreign born.

TABLE 39.

Literacy ¹ of mother.	Births during selected year and infant deaths.					
	Total births.	Live births.			Stillbirths.	
		Total.	Infant deaths.		Number.	Percent. ²
			Number.	Infant mortality rate. ³		
All mothers.....	1,643	1,564	258	165.0	79	4.8
Literate.....	1,355	1,291	200	154.9	64	4.7
Illiterate ⁴	286	271	58	214.0	15	5.2
Not reported.....	2	2				
Foreign-born mothers.....	1,095	1,041	191	183.5	54	4.9
Literate.....	834	793	139	175.3	41	4.9
Illiterate.....	261	248	52	209.7	13	5.0
French-Canadian mothers.....	610	574	129	224.7	36	5.9
Literate.....	524	497	111	223.3	27	5.2
Illiterate.....	86	77	18		9	5.2
Other foreign-born mothers.....	485	467	62	132.8	18	3.7
Literate.....	310	296	28	94.6	14	4.5
Illiterate.....	175	171	34	198.8	4	2.3

¹ Persons who can read and write in any language are reported literate.

² Not shown where base is less than 100.

³ Includes 25 native mothers.

Conditions peculiar to French Canadians.—Since those conditions which have been shown to be factors in a high infant mortality rate exist to practically no greater extent among the French Canadians than among the other groups, the reasons for the excessive infant mortality rate among the babies of French-Canadian mothers must be sought, perhaps, in conditions of living that are peculiar to this group.

Lack of Americanization—that is, retention of a foreign language and maintenance of such distinct channels of expression as separate schools, churches, orphanages, political and pleasure clubs, as well as a daily paper printed in a foreign language—may tend to narrow and limit that opportunity for contact which might have an educational value along hygienic and other lines. But this question was not pursued far enough to justify any positive conclusion as to its importance in retarding the development of the French Canadians. In any case these social conditions would affect the baby largely as they modified customs within the home itself.

In their method of feeding and in the size of their families the French Canadians show distinctive conditions which may account partly for the difference between their infant mortality rate and the rates of other groups of foreign born.

FEEDING.

Feeding and infant mortality.—Method of feeding is among the factors immediately related to infant mortality. Feeding is often the primary means through which the less direct factors, such as employment of mothers away from home and low income with insufficient food and rest for the mother, exert their influence. The mother's intelligence and care are also reflected in the baby's feeding, although the mother's ignorance is itself often but the consequence of low economic status and early entrance into gainful employment. The importance of feeding to infant welfare is universally acknowledged, and authorities are also agreed in emphasizing the great superiority of breast feeding to any substitute for mother's milk.

Of the 1,643 babies included in this report, 1,564 were live born, and of this number 1,535 survived long enough to be fed. Upon this latter group, then, the study of feeding is based. Only the first nine months were taken into account in the study of feeding, because as a rule breast feeding after that period is not necessary to the baby's welfare.

Effects of feeding in each month of age.—The chances of survival for babies deprived of breast milk at an early age are decidedly less than those for babies nursed for a longer period. A comparison of the babies being breast fed and those being artificially fed any month up to the ninth reveals the fact that the percentage who failed to survive infancy was from two to five times as high among babies being artificially fed as among those receiving breast milk exclusively. (See Table 40.)

TABLE 40.

Infants born during selected year and surviving at beginning of specified month.

Month of life and type of feeding.	All mothers.				Native mothers.				Foreign-born mothers.						
	Total.	Died in—		Specified month.	Total.	Died in—		Specified month.	Total.	Died in—		Specified month.			
		First year.	Number.			Per cent.	First year.			Number.	Per cent.		First year.	Number.	Per cent.
First month.....	1,564	258	16.5	72	523	67	12.8	16	1,041	191	18.3	56			
Breast exclusively.....	1,238	148	12.0	26	420	38	9.0	6	818	110	13.4	20			
Mixed.....	57	15	26.3	3	15	1	6.7	.....	42	14	33.3	3		
Artificial exclusively.....	238	66	27.7	14	82	22	26.8	4	156	44	28.2	10			
Not fed, died at once.....	29	29	.....	29	6	6	.....	6	23	23	.....	23
Not reported.....	2	.....	.....	.....	.....	.....	.....	.....	2	.....	.....	.....
Second month.....	1,492	186	12.5	24	507	51	10.1	4	985	135	13.7	20			
Breast exclusively.....	1,067	92	8.6	12	353	22	6.2	1	714	70	9.8	11			
Mixed.....	90	18	20.0	2	25	1	4.0	.....	65	17	26.2	2		
Artificial exclusively.....	333	76	22.8	10	129	28	21.7	3	204	48	23.5	7			
Not reported.....	2	.....	.....	.....	.....	.....	.....	.....	2	.....	.....	.....
Third month.....	1,468	162	11.0	24	503	47	9.3	4	965	115	11.9	20			
Breast exclusively.....	910	53	5.8	9	305	14	4.6	1	605	39	6.4	8			
Mixed.....	129	24	18.6	4	33	3	9.1	.....	96	21	21.9	4		
Artificial exclusively.....	427	85	19.9	11	165	30	18.2	3	262	55	21.0	8			
Not reported.....	2	.....	.....	.....	.....	.....	.....	.....	2	.....	.....	.....
Fourth month.....	1,444	138	9.6	18	499	43	8.6	7	945	95	10.1	11			
Breast exclusively.....	742	31	4.2	6	250	7	2.8	3	492	24	4.9	3			
Mixed.....	184	21	11.4	2	48	5	10.4	.....	136	16	11.8	2		
Artificial exclusively.....	516	86	16.7	10	201	31	15.4	4	315	55	17.5	6			
Not reported.....	2	.....	.....	.....	.....	.....	.....	.....	2	.....	.....	.....
Fifth month.....	1,426	120	8.4	18	492	36	7.3	5	934	84	9.0	13			
Breast exclusively.....	633	17	2.7	.....	211	2	.9	.....	422	15	3.6	.....		
Mixed.....	229	22	9.6	4	63	4	6.3	.....	166	18	10.8	4		
Artificial exclusively.....	562	81	14.4	14	218	30	13.8	5	344	51	14.8	9			
Not reported.....	2	.....	.....	.....	.....	.....	.....	.....	2	.....	.....	.....
Sixth month.....	1,408	102	7.2	21	487	31	6.4	10	921	71	7.7	11			
Breast exclusively.....	523	14	2.7	3	174	1	.6	1	349	13	3.7	2			
Mixed.....	281	20	7.1	5	81	4	4.9	3	200	16	8.0	2			
Artificial exclusively.....	602	68	11.3	13	232	26	11.2	6	370	42	11.4	7			
Not reported.....	2	.....	.....	.....	.....	.....	.....	.....	2	.....	.....	.....
Seventh month.....	1,387	81	5.8	18	477	21	4.4	5	910	60	6.6	13			
Breast exclusively.....	386	10	2.6	1	125	.....	.....	.....	261	10	3.8	1
Mixed.....	354	14	4.0	2	107	.....	.....	.....	247	14	5.7	2
Artificial exclusively.....	645	57	8.8	15	245	21	8.6	5	400	36	9.0	10			
Not reported.....	2	.....	.....	.....	.....	.....	.....	.....	2	.....	.....	.....
Eighth month.....	1,369	63	4.6	11	472	16	3.4	3	897	47	5.2	8			
Breast exclusively.....	314	6	1.9	.....	98	.....	.....	.....	216	6	2.8	.....		
Mixed.....	391	13	3.3	2	122	.....	.....	.....	269	13	4.8	2
Artificial exclusively.....	662	44	6.6	9	252	16	6.3	3	410	28	6.8	6			
Not reported.....	2	.....	.....	.....	.....	.....	.....	.....	2	.....	.....	.....
Ninth month.....	1,358	52	3.8	20	469	13	2.8	6	889	39	4.4	14			
Breast exclusively.....	247	5	2.0	1	79	.....	.....	.....	168	5	3.0	1
Mixed.....	410	9	2.2	3	129	.....	.....	.....	281	9	3.2	3
Artificial exclusively.....	699	38	5.4	16	261	13	5.0	6	438	25	5.7	10			
Not reported.....	2	.....	.....	.....	.....	.....	.....	.....	2	.....	.....	.....

The total number of babies who were breast fed exclusively during their first month was 1,238, and of these 12 per cent failed to survive till the end of the year. Among the 238 babies who were artificially

fed during this month, however, 27.7 per cent died before the end of the year. There were 1,492 babies who survived until the beginning of the second month; 1,067 of these were breast fed during this month and 333 received no breast milk whatever. In the former group only 8.6 per cent died before the end of the year, while in the latter group, babies being artificially fed during the second month, 22.8 per cent failed to survive infancy. The percentages of infant deaths for the two groups, according to feeding in the third month, were 5.8 and 19.9, respectively, and for the succeeding months similar differences in the proportion of infant deaths in each group appear. At the beginning of the ninth month there were 1,358 babies living, of whom 247 were nursed exclusively in this month and 699 were artificially fed. In the first group 2 per cent died before reaching 12 months, while 5.4 per cent of the second group failed to live to that age. The difference in rates here, of course, can not be attributed to the relative influence of breast and artificial feeding at 9 months. But effects of both types of feeding are cumulative, and at any period during infancy they show in the subsequent death rates among the survivors. Not only the feeding being given during any specified month but also the feeding during all or a part of the preceding months of the child's life cause the difference in death rates later.

The above comparisons are between breast feeding exclusively and artificial feeding exclusively during various periods of the first 9 months. The influence of mixed feeding—that is, part breast milk and part other food—upon the infant death rate is less pronounced. Babies whose feeding was mixed, in all groups compared, died in less numbers relatively than those being artificially fed and in greater numbers relatively than those being breast fed. In the early months exclusive breast feeding appears to be of most importance to a baby's welfare, for during this period the percentage of infant deaths among babies whose feeding is mixed more closely approaches that for babies being artificially fed than that for babies being exclusively breast fed. After the sixth month the reverse is practically true, and in the ninth month the advantage of exclusive breast feeding over mixed feeding, so far as it is indicated by the infant death rates, almost disappears.

A somewhat sharper contrast in the effects of feeding as indicated by death rates appears if we consider all babies alive at specified ages who had received a single type of feeding during their entire life up to that age. Of the infants alive at the end of 3 months only 4.9 per cent of those who had been breast fed up to that time died later under 1 year of age, while those who had been fed otherwise died at from more than two to nearly four times this rate. Of the infants who had been breast fed exclusively during the first 6 months of life only 2.1 per cent died under 1 year of age, as compared with per-

centages about six times as great for those who had had either mixed or artificial feeding during the same period. At the end of 9 months there were 244 infants who had had only breast milk and 177 who had never had it; 1.6 per cent of the first group and 3.4 per cent of the second subsequently died under 1 year of age.

TABLE 41.

Infants born during selected year and surviving at specified time.

Type of feeding, age of infant, and nativity of mother.	Died later in year.											
	Total.	Total.		In specified month of age.								
		Number.	Per cent.	Fourth.	Fifth.	Sixth.	Seventh.	Eighth.	Ninth.	Tenth.	Eleventh.	Twelfth.
ALL MOTHERS. ¹												
Type of feeding:												
At 3 months of age.....	1,442	138	9.6	18	18	21	18	11	20	11	9	12
Breast.....	901	44	4.9	6	2	11	7	2	4	2	4	6
Mixed.....	125	20	16.0	2	4	1	1	1	4	3	2	2
Artificial.....	416	74	17.8	10	12	9	10	8	12	6	3	4
During first 3 months.....	1,442	138	9.6	18	18	21	18	11	20	11	9	12
Breast exclusively.....	900	44	4.9	6	2	11	7	2	4	2	4	6
Mixed exclusively.....	41	5	12.2	1	1	1	1	1	1	1	1	1
Artificial exclusively.....	206	35	17.0	3	5	3	8	4	6	3	1	2
More than one type.....	295	54	18.3	9	10	7	2	5	10	5	3	3
At 6 months of age.....	1,385	81	5.8	18	11	11	18	11	20	11	9	12
Breast.....	520	11	2.1	1	1	1	1	1	1	1	1	1
Mixed.....	276	15	5.4	2	2	2	2	2	3	2	2	4
Artificial.....	589	55	9.3	15	8	16	15	8	16	8	4	4
During first 6 months.....	1,385	81	5.8	18	11	11	18	11	20	11	9	12
Breast exclusively.....	518	11	2.1	1	1	1	1	1	1	1	1	1
Mixed exclusively.....	31	4	12.9	1	1	1	1	1	1	1	1	1
Artificial exclusively.....	195	24	12.3	8	4	6	8	4	6	3	1	2
More than one type.....	641	42	6.6	8	6	13	8	6	13	6	4	5
At 9 months of age.....	1,336	32	2.4	11	9	12	11	9	12	11	9	12
Breast.....	246	4	1.6	2	2	2	2	2	2	2	2	2
Mixed.....	407	6	1.5	1	1	1	1	1	1	1	1	1
Artificial.....	683	22	3.2	8	6	13	8	6	13	6	4	5
During first 9 months.....	1,336	32	2.4	11	9	12	11	9	12	11	9	12
Breast exclusively.....	244	4	1.6	2	2	2	2	2	2	2	2	2
Mixed exclusively.....	25	2	8.0	1	1	1	1	1	1	1	1	1
Artificial exclusively.....	177	6	3.4	3	3	3	3	3	3	3	3	3
More than one type.....	890	20	2.2	7	6	7	7	6	7	6	7	7
NATIVE MOTHERS.												
Type of feeding:												
At 3 months of age.....	499	43	8.6	7	5	10	5	3	6	3	2	2
Breast.....	304	13	4.3	3	1	5	2	1	4	1	1	1
Mixed.....	33	3	9.1	1	1	1	1	1	1	1	1	1
Artificial.....	162	27	16.7	4	4	4	3	3	6	1	1	2
During first 3 months.....	499	43	8.6	7	5	10	5	3	6	3	2	2
Breast exclusively.....	304	13	4.3	3	1	5	2	1	4	1	1	1
Mixed exclusively.....	10	1	10.0	1	1	1	1	1	1	1	1	1
Artificial exclusively.....	74	14	18.9	3	3	2	2	1	4	1	1	1
More than one type.....	111	16	14.4	4	1	3	1	2	2	1	1	1
At 6 months of age.....	477	21	4.4	5	3	6	5	3	6	3	2	2
Breast.....	173	1	0.6	1	1	1	1	1	1	1	1	1
Mixed.....	78	1	1.3	1	1	1	1	1	1	1	1	1
Artificial.....	226	20	8.8	3	3	2	5	3	6	3	1	2
During first 6 months.....	477	21	4.4	5	3	6	5	3	6	3	2	2
Breast exclusively.....	173	1	0.6	1	1	1	1	1	1	1	1	1
Mixed exclusively.....	6	1	16.7	1	1	1	1	1	1	1	1	1
Artificial exclusively.....	69	9	13.0	2	2	2	2	1	4	1	1	1
More than one type.....	229	12	5.2	3	2	2	3	2	2	2	2	1
At 9 months of age.....	463	7	1.5	3	2	2	3	2	2	3	2	2
Breast.....	79	1	1.3	1	1	1	1	1	1	1	1	1
Mixed.....	129	7	5.4	2	2	2	2	2	2	2	2	2
Artificial.....	255	7	2.7	3	2	2	3	2	2	3	2	3
During first 9 months.....	463	7	1.5	3	2	2	3	2	2	3	2	3
Breast exclusively.....	78	1	1.3	1	1	1	1	1	1	1	1	1
Mixed exclusively.....	6	1	16.7	1	1	1	1	1	1	1	1	1
Artificial exclusively.....	62	2	3.2	1	1	1	1	1	1	1	1	1
More than one type.....	317	5	1.6	2	2	2	2	2	2	2	2	1

¹ Excluding 2 infants surviving 1 year for whom feeding was not reported.

TABLE 41—Continued.

TABLE 41—Continued.		Infants born during selected year and surviving at specified time.												
Type of feeding, age of infant, and nativity of mother.		Total.	Died later in year.											
			Number.	Per cent.	In specified month of age.									Twelfth.
					Fourth.	Fifth.	Sixth.	Seventh.	Eighth.	Ninth.	Tenth.	Eleventh.		
FOREIGN-BORN MOTHERS. ¹														
Type of feeding:														
At 3 months of age.....		943	95	10.1	11	13	11	13	8	14	8	7	10	6
Breast.....		597	31	5.2	3	1	6	5	2	4	1	3	6	2
Mixed.....		92	17	18.5	2	4	1	1	4	2	1	2	2	2
Artificial.....		254	47	18.5	6	8	5	7	5	6	5	3	2	2
During first 3 months.....		943	95	10.1	11	13	11	13	8	14	8	7	10	6
Breast exclusively.....		596	31	5.2	3	1	6	5	2	4	1	3	6	2
Mixed exclusively.....		31	5	16.1	1	1	1	1	1	1	1	1	1	1
Artificial exclusively.....		132	21	15.9	3	2	1	6	3	2	2	1	1	1
More than one type.....		184	38	20.7	5	9	4	1	3	8	4	2	2	2
At 6 months of age.....		908	60	6.6	5	13	8	13	8	14	8	7	10	6
Breast.....		347	11	3.2	1	1	1	1	1	1	1	3	4	4
Mixed.....		198	14	7.1	2	2	2	2	2	3	2	1	4	2
Artificial.....		363	35	9.6	10	5	10	5	10	5	3	2	2	2
During first 6 months.....		908	60	6.6	5	13	8	13	8	14	8	7	10	6
Breast exclusively.....		345	11	3.2	1	1	1	1	1	1	1	3	4	4
Mixed exclusively.....		25	4	16.0	1	1	1	1	1	1	1	1	1	1
Artificial exclusively.....		126	15	11.9	6	3	2	2	2	2	1	1	1	1
More than one type.....		412	30	7.3	5	4	11	4	2	4	2	4	4	4
At 9 months of age.....		873	25	2.9	8	7	10	2	2	2	2	2	2	2
Breast.....		167	4	2.4	2	2	2	2	2	2	2	2	2	2
Mixed.....		278	6	2.2	6	5	4	4	4	4	4	4	4	4
Artificial.....		428	15	3.5	8	7	10	2	2	2	2	2	2	2
During first 9 months.....		873	25	2.9	8	7	10	2	2	2	2	2	2	2
Breast exclusively.....		166	4	2.4	1	1	1	1	1	1	1	1	1	1
Mixed exclusively.....		19	2	10.5	2	1	1	1	1	1	1	1	1	1
Artificial exclusively.....		115	4	3.5	2	1	1	1	1	1	1	1	1	1
More than one type.....		573	15	2.6	5	4	6	5	4	4	4	4	4	4
French-Canadian mothers.														
Type of feeding:														
At 3 months of age.....		511	66	12.9	10	9	7	13	5	9	5	3	5	5
Breast.....		269	18	6.7	3	1	3	5	3	3	1	1	2	2
Mixed.....		43	11	25.6	1	2	1	1	1	2	1	1	1	2
Artificial.....		199	37	18.6	6	6	4	7	4	4	4	1	1	1
During first 3 months.....		511	66	12.9	10	9	7	13	5	9	5	3	5	5
Breast exclusively.....		269	18	6.7	3	1	3	5	3	3	1	1	2	2
Mixed exclusively.....		15	4	26.7	1	1	1	1	1	1	1	1	1	1
Artificial exclusively.....		106	16	15.1	3	2	1	6	2	1	1	1	1	1
More than one type.....		121	28	23.1	4	6	3	1	3	5	3	1	2	2
At 6 months of age.....		485	40	8.2	13	5	9	5	9	5	3	5	5	5
Breast.....		138	4	2.9	2	1	1	1	1	1	1	2	2	2
Mixed.....		71	8	11.3	2	1	1	2	1	1	1	1	1	2
Artificial.....		276	28	10.1	10	4	8	4	8	4	1	1	1	1
During first 6 months.....		485	40	8.2	13	5	9	5	9	5	3	5	5	5
Breast exclusively.....		138	4	2.9	1	1	1	1	1	1	1	2	2	2
Mixed exclusively.....		14	4	28.6	1	1	1	1	1	1	1	1	1	1
Artificial exclusively.....		100	10	10.0	6	2	1	1	2	1	1	1	1	1
More than one type.....		233	22	9.4	5	3	8	3	5	3	1	2	2	2
At 9 months of age.....		458	13	2.8	5	3	8	3	5	3	5	3	5	5
Breast.....		58	1	1.7	1	1	1	1	1	1	1	1	1	1
Mixed.....		86	3	3.5	1	1	1	1	1	1	1	2	2	2
Artificial.....		314	9	2.9	4	3	2	4	3	2	2	2	2	2
During first 9 months.....		458	13	2.8	5	3	8	3	5	3	5	3	5	5
Breast exclusively.....		58	1	1.7	1	1	1	1	1	1	1	1	1	1
Mixed exclusively.....		8	2	25.0	1	1	1	1	1	1	1	1	1	1
Artificial exclusively.....		91	1	1.1	1	1	1	1	1	1	1	1	1	1
More than one type.....		301	9	3.0	3	3	3	3	3	3	3	3	3	3
Other foreign-born mothers. ¹														
Type of feeding:														
At 3 months of age.....		432	29	6.7	1	4	4	3	5	3	4	4	5	4
Breast.....		328	13	4.0	1	3	3	2	1	1	1	2	4	4
Mixed.....		49	6	12.2	1	2	1	2	2	2	1	1	2	2
Artificial.....		55	10	18.2	2	1	1	1	2	2	1	2	2	2

¹ Excluding 2 infants surviving 1 year for whom feeding was not reported.

TABLE 41—Continued.

Type of feeding, age of infant, and nativity of mother.	Infants born during selected year and surviving at specified time.											
	Total.	Died later in year.										
		In specified month of age.										Twelfth.
		Number.	Per cent.	Fourth.	Fifth.	Sixth.	Seventh.	Eighth.	Ninth.	Tenth.	Eleventh.	
FOREIGN-BORN MOTHERS—continued.												
<i>Other foreign-born mothers—Continued.</i>												
Type of feeding—Continued.												
During first 3 months.....	432	29	6.7	1	4	4	3	5	3	4	5	
Breast exclusively.....	327	13	4.0			3	2	1	1	2	4	
Mixed exclusively.....	16	1	6.3		1							
Artificial exclusively.....	26	5	19.2				1	1		1	1	
More than one type.....	63	10	15.9	1	3	1			1	1		
At 6 months of age.....	423	20	4.7				3	5	3	4	5	
Breast.....	209	7	3.3				1	1	1	2	2	
Mixed.....	127	6	4.7				1	2	1	1	2	
Artificial.....	87	7	8.0				1	2	1	2	1	
During first 6 months.....	423	20	4.7				3	5	3	4	5	
Breast exclusively.....	207	7	3.4				1	1	1	2	2	
Mixed exclusively.....	11											
Artificial exclusively.....	26	5	19.2				1	1		1	1	
More than one type.....	179	8	4.5				1	3	1	1	2	
At 9 months of age.....	415	12	2.9						3	4	5	
Breast.....	109	3	2.8							2	1	
Mixed.....	192	3	1.6									
Artificial.....	114	6	5.3						2	2	2	
During first 9 months.....	415	12	2.9						3	4	5	
Breast exclusively.....	108	3	2.8							2	1	
Mixed exclusively.....	11											
Artificial exclusively.....	24	3	12.5							1	1	
More than one type.....	272	6	2.2						2	1	3	

Feeding methods and nationality.—The practice in regard to breast feeding varied according to nationality, economic status, and gainful employment of the mother. On the whole, foreign-born mothers other than French-Canadian nursed their babies longest. At the end of three months 75.9 per cent of foreign-born mothers except French-Canadian, 60.9 per cent of native mothers, and 52.6 per cent of French-Canadian mothers were exclusively breast feeding their babies. At the end of 6 months these percentages were 49.4, 36.3, and 28.5, respectively. At 9 months the contrast is similar, and in addition at each of these periods the foreign-born mothers other than French-Canadian much more commonly than either of the other classes of mothers were using a mixed diet for their babies. No doubt the great extent of exclusively artificial feeding among babies of French-Canadian mothers is a large factor in accounting for their high infant death rate.

If instead of considering the type of feeding at the end of these three age periods we consider the type during the same periods, we find the same tendency in the different groups, and as far as breast feeding is concerned almost identical percentages in each case.

TABLE 42.	Type of feeding and age of infant.	Per cent distribution of infants of —		
		Native mothers.	Foreign-born mothers.	
			French-Canadian.	Other.
Type of feeding:				
At 3 months of age.....		100.0	100.0	100.0
Breast.....		60.9	52.6	75.9
Mixed.....		6.6	8.4	11.3
Artificial.....		32.5	38.9	12.7
During first 3 months.....		100.0	100.0	100.0
Breast exclusively.....		60.9	52.6	75.7
Mixed exclusively.....		2.0	2.9	3.7
Artificial exclusively.....		14.8	20.7	6.0
More than one type.....		22.2	23.7	14.6
At 6 months of age.....		100.0	100.0	100.0
Breast.....		36.3	28.5	49.4
Mixed.....		16.4	14.6	30.0
Artificial.....		47.4	56.9	20.6
During first 6 months.....		100.0	100.0	100.0
Breast exclusively.....		36.3	28.5	48.9
Mixed exclusively.....		1.3	2.9	2.6
Artificial exclusively.....		14.5	20.6	6.1
More than one type.....		48.0	48.0	42.3
At 9 months of age.....		100.0	100.0	100.0
Breast.....		17.1	12.7	26.3
Mixed.....		27.9	18.8	46.3
Artificial.....		55.1	68.6	27.5
During first 9 months.....		100.0	100.0	100.0
Breast exclusively.....		16.8	12.7	26.0
Mixed exclusively.....		1.3	1.7	2.7
Artificial exclusively.....		13.4	19.9	5.8
More than one type.....		68.5	65.7	65.5

An analysis of the relation of type of feeding to infant mortality according to nationality shows practically no difference in results. The same tendency for a high infant mortality rate to accompany artificial feeding occurs among the babies of both native and foreign-born mothers. As might be expected from the higher general rate, the babies of foreign-born mothers show in nearly all cases, whatever the type of feeding, a higher death rate than babies of native mothers. (See Table 40.)

Feeding methods in economic groups.—Native and foreign-born mothers in the same economic classes do not show the same tendencies with reference to the baby's feeding. For the purpose of simplifying the comparison, economic classes were reduced to three—fathers earning under \$650, fathers earning from \$650 to \$1,049, and fathers earning \$1,050 and over. Among native mothers artificial feeding existed to the greatest extent in the poorest class and the percentage of babies artificially fed declined with the rise in father's earnings. Of babies of native mothers 35.4 per cent were artificially fed at 3 months of age in the class where the father's earnings were under \$650; 30.8 per cent where the earnings were \$650 to \$1,049; and 28.1 per cent where the earnings were \$1,050 and over. In contrast to this, among babies of the same age of foreign-born mothers 23.6 per cent were being artificially fed in the

class where father's earnings were under \$650; 31.8 per cent in the next higher class; and 26.4 per cent in the highest economic group, where father's earnings were \$1,050 and over. An analysis of the feeding given at 6 months according to nativity of mother and earnings of father reveals a similar situation.

Among foreign-born mothers, then, the poorest mothers nurse their babies to the greatest extent, and the mothers in the middle economic class nurse their babies least. French-Canadian mothers should be excepted from this generalization since, as has been shown, their general custom in regard to nursing the baby differs radically from that of other foreign-born mothers. Among the Polish mothers the extent of artificial feeding is almost negligible.

TABLE 43.

Infants living and artificially fed at specified age and nationality of mother.

TABLE 43.	Infants born during selected year.					
Infants living and artificially fed at specified age and nationality of mother.	Total.	Whose fathers earned specified amount.				
		Under \$650.	\$650 to \$1,049.	\$1,050 and over.	No earnings. ¹	Not reported.
ALL MOTHERS.						
Infants living at end of 3 months..	1,444	691	548	168	18	19
Number artificially fed.....	416	182	172	46	9	7
Per cent artificially fed.....	28.8	26.3	31.4	27.4	50.0	36.8
Infants living at end of 6 months..	1,387	661	529	163	17	17
Number artificially fed.....	589	260	245	67	8	9
Per cent artificially fed.....	42.5	39.3	46.3	41.1	47.1	52.8
Infants living at end of 9 months..	1,338	625	519	163	15	16
Number artificially fed.....	683	300	272	95	7	9
Per cent artificially fed.....	51.0	48.0	52.4	58.3	46.7	56.3
NATIVE MOTHERS.						
Infants living at end of 3 months..	499	161	234	96	4	4
Number artificially fed.....	162	57	72	27	4	2
Per cent artificially fed.....	32.5	35.4	30.8	28.1	100.0	50.0
Infants living at end of 6 months..	477	152	223	95	4	3
Number artificially fed.....	226	80	101	39	4	2
Per cent artificially fed.....	47.4	52.6	45.3	41.1	100.0	66.7
Infants living at end of 9 months..	463	142	221	95	3	2
Number artificially fed.....	255	82	112	57	3	1
Per cent artificially fed.....	55.1	57.7	50.7	60.0	100.0	50.0
FOREIGN-BORN MOTHERS.						
Infants living at end of 3 months..	945	530	314	72	14	15
Number artificially fed.....	254	125	100	19	5	5
Per cent artificially fed.....	26.9	23.6	31.8	26.4	35.7	33.3
Infants living at end of 6 months..	910	509	306	68	13	14
Number artificially fed.....	363	180	144	28	4	7
Per cent artificially fed.....	39.9	35.4	47.1	41.2	30.8	50.0
Infants living at end of 9 months..	875	483	298	68	12	14
Number artificially fed.....	428	218	160	38	4	8
Per cent artificially fed.....	48.9	45.1	53.7	55.9	33.3	57.1
French-Canadian mothers.						
Infants living at end of 3 months..	511	260	204	34	6	7
Number artificially fed.....	199	100	80	11	4	4
Per cent artificially fed.....	38.9	38.5	39.2	32.4	66.7	57.1
Infants living at end of 6 months..	485	246	196	31	6	6
Number artificially fed.....	276	139	116	14	4	3
Per cent artificially fed.....	56.9	56.5	59.2	45.2	66.7	50.0
Infants living at end of 9 months..	458	228	188	31	5	6
Number artificially fed.....	314	156	130	21	3	4
Per cent artificially fed.....	68.6	68.4	69.1	67.7	60.0	66.7

¹ Includes 1 father living on his income.

TABLE 43—Continued.

Infants living and artificially fed at specified age and nationality of mother.	Infants born during selected year.					
	Total.	Whose fathers earned specified amount.				
		Under \$650.	\$650 to \$1,049.	\$1,050 and over.	No earn- ings. ¹	Not re- ported.
<i>Polish mothers.</i>						
Infants living at end of 3 months...	147	133	11	.....	1	2
Number artificially fed.....	6	5	1	.....	
Per cent artificially fed.....	4.1	3.8	9.1	.....	
Infants living at end of 6 months...	144	130	11	.....	1	2
Number artificially fed.....	12	9	2	.....		1
Per cent artificially fed.....	8.3	6.9	18.2	.....		50.0
Infants living at end of 9 months...	138	124	11	.....	1	2
Number artificially fed.....	21	17	3	.....		1
Per cent artificially fed.....	15.2	13.7	27.3	.....		50.0
<i>English, Irish, and Scotch mothers.</i>						
Infants living at end of 3 months...	103	41	52	7	2	1
Number artificially fed.....	18	4	13	1		
Per cent artificially fed.....	17.5	9.8	25.0	14.3		
Infants living at end of 6 months...	100	39	52	6	2	1
Number artificially fed.....	25	7	16	2		
Per cent artificially fed.....	25.0	17.9	30.8	33.3		
Infants living at end of 9 months...	100	39	52	6	2	1
Number artificially fed.....	30	12	16	2		
Per cent artificially fed.....	30.0	30.8	30.8	33.3		
<i>Other foreign-born mothers.</i>						
Infants living at end of 3 months...	184	96	47	31	5	5
Number artificially fed.....	31	16	6	7	1	1
Per cent artificially fed.....	16.8	16.7	12.8	22.6	20.0	20.0
Infants living at end of 6 months...	181	94	47	31	4	5
Number artificially fed.....	50	25	10	12		3
Per cent artificially fed.....	27.6	26.6	21.3	38.7		60.0
Infants living at end of 9 months...	179	92	47	31	4	5
Number artificially fed.....	63	33	11	15	1	3
Per cent artificially fed.....	35.2	35.9	23.4	48.4	25.0	60.0

¹ Includes 1 father living on his income.

Effects of feeding modified by income.—A classification of babies both according to type of feeding and according to father's earnings reveals the fact that the economic status of the family modifies the influence of feeding. Poverty nullifies in part the advantages of breast feeding, while an ample income mitigates the disadvantages of artificial feeding. The reason for this may be, as before noted, that poverty usually means low standards and ignorance on the part of the mother, while ample income makes possible the attainment of higher standards, better medical attention, and greater knowledge in the care of the baby.

In the lowest economic class, in which the fathers earn less than \$650, the percentage of breast-fed babies alive at 3 months who failed to survive till the end of the year was 6.7; in the next class the percentage declined to 3.6, while for the highest class, where fathers earned \$1,050 or more, it was only 2.7. The percentages of deaths among artificially fed babies alive at 3 months were 22, 14.5, and 4.3—in the two lower economic classes percentages 3 and 4 times as large as those for breast-fed babies in the same classes. In the highest class the difference between the percentages almost disappears.

An analysis of the distribution of infant deaths occurring among babies who survived 6 months shows the same results. The percentage of deaths among both breast-fed and artificially fed babies decreased with the advance in economic status. In the highest class, in which fathers earned \$1,050 or more, no babies who had survived 6 months died before the end of the year.

TABLE 44.

TABLE 44.		Infants born during selected year and surviving at specified time.									
Type of feeding at specified age.		Total.	Died later in year.		Whose fathers earned specified amount.						
					Under \$650.			\$650 to \$1,049.			
					Total.	Died later in year.		Total.	Died later in year.		
			Num-ber.	Per cent.		Num-ber.	Per cent.		Num-ber.	Per cent.	
Type of feeding:											
At 3 months of age.....		1,444	138	9.6	691	86	12.4	548	40	7.3	
Breast.....		901	44	4.9	434	29	6.7	338	12	3.6	
Mixed.....		125	20	16.0	75	17	22.7	36	8	8.3	
Artificial.....		416	74	17.8	182	40	22.0	172	25	14.5	
Not reported.....		2						2			
At 6 months of age.....		1,387	81	5.8	661	56	8.5	529	21	4.0	
Breast.....		520	11	2.1	237	8	3.4	203	3	1.5	
Mixed.....		276	15	5.4	164	13	7.9	79	2	2.5	
Artificial.....		589	55	9.3	260	35	13.5	245	16	6.5	
Not reported.....		2						2			

		Whose fathers earned specified amount—Continued.							
Type of feeding at specified age.		\$1,050 and over.			No earnings. ¹		Not reported.		
		Total.	Died later in year.		Total.	Died later in year.	Total.	Died later in year.	
			Number.	Per cent.					
Type of feeding:									
At 13 months of age.....		168	5	3.0	18	4	19	3	
Breast.....		112	3	2.7	7		10		
Mixed.....		10			2		2		
Artificial.....		46	2	4.3	9	4	7	3	
At 6 months of age.....		163			17	3	17	1	
Breast.....		69			5		6		
Mixed.....		27			4		2		
Artificial.....		67			8	3	9	1	

¹ Includes 1 father living on his income.

Feeding methods and employment of mother.—Gainful employment of the mother away from home shows a more conspicuous relation to failure to nurse the baby than either nativity or economic status. Among the babies of mothers employed away from home 65.5 per cent were being artificially fed at 3 months of age, as compared with 28.5 per cent artificially fed among the babies of mothers not gainfully employed at that time. Among babies whose mothers

worked at home, however, the percentage of artificial feeding was lower than in either of the above groups—only 18.1. In general this condition was the same both for native and foreign-born mothers. In the native group the percentage of babies weaned at 3 months of age whose mothers were not gainfully employed was 30.2; of those whose mothers worked at home, it was 30.9; but of those whose mothers worked away from home, it was 67.9. Among foreign-born mothers the tendencies according to employment of mother are not identical, but the contrasts are greater. Among babies of foreign-born mothers who worked at home at the time only 15 per cent had been weaned at 3 months; among babies of mothers not employed at all the per cent was 27.4; and among babies of mothers who worked away from home, 64.4. At 6 months 48.3 per cent of the babies of native mothers then employed at home had been weaned, 42.5 per cent in the case of mothers not employed and 83.3 per cent in the case of mothers employed away from home. The proportions for babies of foreign-born mothers weaned at 6 months were 27, 39.1, and 69.6, respectively.

TABLE 45.

TABLE 45. Infants living and artificially fed at specified age and nationality of mother.	Infants born during selected year.				
	Total.	Whose mothers during year following baby's birth—			
		Had no work or began work after time specified.	Began work before time specified and worked—		Did not report time resumed.
			With baby.	Away from baby.	
ALL MOTHERS.					
Infants living at end of 3 months.....	1,444	1,057	288	87	12
Number artificially fed.....	416	301	52	57	6
Per cent artificially fed.....	28.8	28.5	18.1	65.5	50.0
Infants living at end of 6 months.....	1,387	913	299	163	12
Number artificially fed.....	589	369	93	120	7
Per cent artificially fed.....	42.5	40.4	31.1	73.6	58.3
Infants living at end of 9 months.....	1,338	814	297	216	11
Number artificially fed.....	683	420	114	143	6
Per cent artificially fed.....	51.0	51.6	38.4	66.2	54.5
NATIVE MOTHERS.					
Infants living at end of 3 months.....	499	410	55	28	6
Number artificially fed.....	162	124	17	19	2
Per cent artificially fed.....	32.5	30.2	30.9	67.9	33.3
Infants living at end of 6 months.....	477	365	58	48	6
Number artificially fed.....	226	155	28	40	3
Per cent artificially fed.....	47.4	42.5	48.3	83.3	50.0
Infants living at end of 9 months.....	463	342	58	58	5
Number artificially fed.....	255	174	30	49	2
Per cent artificially fed.....	55.1	50.9	51.7	84.5	40.0
FOREIGN-BORN MOTHERS.					
Infants living at end of 3 months.....	945	647	233	59	6
Number artificially fed.....	254	177	35	38	4
Per cent artificially fed.....	26.9	27.4	15.0	64.4	66.7
Infants living at end of 6 months.....	910	548	241	115	6
Number artificially fed.....	363	214	65	80	4
Per cent artificially fed.....	39.9	39.1	27.0	69.6	66.7
Infants living at end of 9 months.....	875	472	239	158	6
Number artificially fed.....	428	246	84	94	4
Per cent artificially fed.....	48.9	52.1	35.1	59.5	66.7

TABLE 45—Continued.

Infants living and artificially fed at specified age and nationality of mother.	Whose mothers during year following baby's birth—				
	Total.	Had no work or began work after time specified.	Began work before time specified and worked—		Did not report time resumed.
			With baby.	Away from baby.	
<i>French-Canadian mothers.</i>					
Infants living at end of 3 months	511	385	78	45	
Number artificially fed	199	142	23	32	
Per cent artificially fed	38.9	36.9	29.5	71.1	66.7
Infants living at end of 6 months	485	323	80	79	
Number artificially fed	276	166	42	66	
Per cent artificially fed	56.9	51.4	52.5	83.5	66.7
Infants living at end of 9 months	458	293	78	84	
Number artificially fed	314	192	49	71	
Per cent artificially fed	68.6	65.5	62.8	84.5	66.7
<i>Polish mothers.</i>					
Infants living at end of 3 months	147	74	70	1	
Number artificially fed	6	3	1	1	
Per cent artificially fed	4.1	4.1	1.4	100.0	50.0
Infants living at end of 6 months	144	66	68	8	
Number artificially fed	12	4	4	3	
Per cent artificially fed	8.3	6.1	5.9	37.5	50.0
Infants living at end of 9 months	138	29	67	40	
Number artificially fed	21	4	9	7	
Per cent artificially fed	15.2	13.8	13.4	17.5	50.0
<i>English, Irish, and Scotch mothers.</i>					
Infants living at end of 3 months	103	74	25	3	
Number artificially fed	18	11	5	1	
Per cent artificially fed	17.5	14.9	20.0	33.3	100.0
Infants living at end of 6 months	100	57	32	10	
Number artificially fed	25	14	5	5	
Per cent artificially fed	25.0	24.6	15.6	50.0	100.0
Infants living at end of 9 months	100	54	32	13	
Number artificially fed	30	16	7	6	
Per cent artificially fed	30.0	29.6	21.9	46.2	100.0
<i>Other foreign-born mothers.</i>					
Infants living at end of 3 months	184	114	60	10	
Number artificially fed	31	21	6	4	
Per cent artificially fed	16.8	18.4	10.0	40.0	
Infants living at end of 6 months	181	102	61	18	
Number artificially fed	50	30	14	6	
Per cent artificially fed	27.6	29.4	23.0	33.3	
Infants living at end of 9 months	179	96	62	21	
Number artificially fed	63	34	19	10	
Per cent artificially fed	35.2	35.4	30.6	47.6	

General discussion of feeding methods.—It appears from these facts that in the case of native mothers both gainful employment away from home and low economic status are frequently accompanied by early weaning of the baby. The mothers who worked away from home are on the whole the poorest mothers; hence the very large proportion of their babies weaned by the age of 3 and 6 months—namely, 67.9 and 83.3 per cent. Among foreign-born mothers, however, low economic status, as has been shown, is accompanied by a general tendency to nurse the baby. Mothers who worked away from home, however, were often required to wean their babies, for 64.4 per cent of these babies were weaned at 3 months and 69.6 per cent at 6 months.

The reason for the divergence in the customs of native and foreign-born mothers (other than French-Canadian) as to the feeding of the baby is not apparent. Possibly the other foreign-born mothers in the poorest classes still follow a custom from which the native mothers, who know more of substitutes for mother's milk, have broken away. The latter and the French-Canadian mothers as well are constantly appealed to by advertisements of patent infant foods. Indeed, one mother gave as a reason for ceasing to nurse her baby that she wanted to try the samples of patent infant foods which had been given her.

Of the native mothers those in the highest economic class, contrary to expectation, practiced breast feeding most commonly, and in this same group, because of access to competent medical advice and because of the better education of the mothers generally, they are apt to make more intelligent use of artificial food and their babies are likely to suffer least from artificial feeding. These very circumstances, however, may explain the reason for the greater readiness of these mothers to nurse their babies, for they would be the class to be reached first by the campaigns of public education in favor of breast feeding which have been carried on in recent years.

Substitutes for mother's milk.—Artificially fed babies of the poorer mothers suffer under the extra handicap of the ignorance of such mothers as to the proper feeding of babies. The importance of a pure city milk supply and of infant-welfare stations to this class of babies is obvious. In Manchester the substitutes for mother's milk most frequently resorted to were condensed milk, patent infant foods, and whole milk. Only infrequently did mothers report that they gave their babies modified milk. The cows' milk was usually the same grade as that used for adult consumption.

There are two grades of milk officially recognized by the city department of health, and of these "inspected milk" is the superior and the one suitable for infants. This grade of milk, however, was only provided for by the State board of health in April, 1913, and introduced into Manchester in the same year. About 10 per cent of the entire supply was pasteurized.

MATERNAL HISTORIES.

Data were obtained from the mothers regarding all pregnancies which they had had previous to the birth of the baby during the selected year. This information included the following details: The total number of pregnancies and the result of each—that is, whether a live-born child, a stillborn child, or a miscarriage; the year of birth and sex of each child; the number of live-born children who had died, and the age of each at death. An analysis of these maternal histories serves to supplement the more detailed study of infants born during a single year.

The histories of 1,618 mothers form the basis of the study of the issues of all pregnancies. From 6 of the 1,624 mothers of babies

J. F. WOODWARD

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► **STUDY**

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stillbirths and miscarriages.—The stillbirths reported formed but a small proportion of all births. It is likely, however, that the number of stillbirths and of miscarriages is understated. The registration of stillbirths is less complete than the registration of live births, and it is difficult to secure from the mother information about both stillbirths and miscarriages than about live-born children.

per mother and nativity of mother.	Number of mothers.							
	Total.	Reporting specified number of miscarriages.						
		None.	1	2	3	4	5	6
.....	1,618	1,425	125	46	15	4	1	2
.....	433	433						
.....	301	287	14					
.....	215	192	19	3	1			
.....	170	139	23	7	1			
.....	107	90	11	6				
.....	103	78	18	7				
.....	72	56	9	4	2	1		
.....	50	36	6	7	1			
.....	45	33	8	3	1			
.....	32	22	5	2	1	2		
.....	30	21	4	2	3			
.....	17	12	2		2	1		
.....	19	11	3	3	1		1	
.....	10	7	1		1			1
.....	8	4	1	1	1			1
.....	5	3	1	1				
.....	1	1						
mothers.....	540	481	37	17	2	3		
.....	188	188						
.....	117	110	7					
.....	90	79	9	2				
.....	46	33	8	5				
.....	28	25	2	1				
.....	28	19	3	6				
.....	18	12	4		1	1		
.....	10	6	2	1	1			
.....	3	2		1				
.....	4	3				1		
.....	5	3	1	1				
.....	1					1		
.....	2	1	1					
born mothers.....	1,078	944	88	29	13	1	1	2
.....	245	245						
.....	184	177	7					
.....	125	113	10	1	1			
.....	124	106	15	2	1			
.....	79	65	9	5				
.....	75	59	15	1				
.....	54	44	5	4	1			
.....	40	30	4	6				
.....	42	31	8	2	1			
.....	28	19	5	2	1	1		
.....	25	18	3	1	3			
.....	16	12	2		2			
.....	19	11	3	3	1		1	
.....	8	6			1			1
.....	8	4	1	1	1			1
.....	5	3	1	1				
.....	1	1						

¹ Including miscarriages.



Age at death.—A large proportion of the deaths reported by the mothers among all infants borne by them occurred during the early period of infancy. Of the total number of deaths, 218, or 21.2 per cent, occurred within the first two weeks after birth.

The maternal histories do not furnish the details necessary for an extended analysis of the causes of infant mortality in the whole group of 6,061 babies. The influence exercised by economic status, size of family, and other factors is however indicated to some extent.

TABLE 49.

Live births per mother and nativity of mother.

	Number of mothers.							
	Total.	Reporting specified number of infant deaths.						
		None.	1	2	3	4	5	Over 5.
All mothers.....	1,501	955	412	123	68	17	8	8
Live births:								
1.....	442	367	75	.....	.....	.....	.....	.....
2.....	310	241	60	9	.....	.....	.....	.....
3.....	219	131	73	12	3	.....	.....	.....
4.....	156	79	56	15	6	.....	.....	.....
5.....	115	61	38	13	2	.....	1	.....
6.....	86	25	38	13	7	2	1	.....
7.....	72	16	19	22	11	3	1	.....
8.....	48	13	15	10	9	1	.....	.....
9.....	42	11	17	8	5	.....	.....	1
10.....	32	7	6	6	8	5	.....	.....
11.....	23	.....	5	6	6	2	2	2
12.....	17	1	5	5	3	1	1	1
13.....	12	1	2	3	3	1	.....	2
14.....	8	.....	2	.....	1	2	1	2
15.....	4	.....	1	1	2	.....	.....	.....
16.....	4	2	.....	.....	1	.....	1	.....
18.....	1	.....	.....	.....	1	.....	.....	.....
Native mothers.....	526	379	112	22	8	2	3	.....
Live births:								
1.....	187	171	16	.....	.....	.....	.....	.....
2.....	125	99	24	2	.....	.....	.....	.....
3.....	87	55	25	6	1	.....	.....	.....
4.....	39	21	13	5	.....	.....	.....	.....
5.....	34	19	10	4	.....	.....	1	.....
6.....	21	7	11	1	1	.....	1	.....
7.....	13	3	5	3	1	.....	1	.....
8.....	6	.....	3	.....	2	1	.....	.....
9.....	5	2	2	1	.....	.....	.....	.....
10.....	4	2	2	.....	.....	.....	.....	.....
11.....	4	.....	1	.....	3	.....	.....	.....
14.....	1	.....	.....	.....	.....	1	.....	.....
Foreign-born mothers.....	1,065	576	300	101	60	15	5	8
Live births:								
1.....	255	196	59	.....	.....	.....	.....	.....
2.....	185	142	36	7	.....	.....	.....	.....
3.....	132	76	48	6	2	.....	.....	.....
4.....	117	58	43	10	6	.....	.....	.....
5.....	81	42	28	9	2	.....	.....	.....
6.....	65	18	27	12	6	2	.....	.....
7.....	59	13	14	19	10	3	.....	.....
8.....	42	13	12	10	7	.....	.....	.....
9.....	37	9	15	7	5	.....	.....	1
10.....	28	5	4	6	8	5	.....	.....
11.....	19	.....	4	6	3	2	2	2
12.....	17	1	5	5	3	1	1	1
13.....	12	1	2	3	3	1	.....	2
14.....	7	.....	2	.....	1	1	1	2
15.....	4	.....	1	1	2	.....	.....	.....
16.....	4	2	.....	.....	1	.....	1	.....
18.....	1	.....	.....	.....	1	.....	.....	.....

TABLE 50.		Number of mothers.							
		Total.	Reporting specified number of still-births and deaths of infants aged 2 weeks or less.						
			None.	1	2	3	4	5	6
Births per mother and nativity of mother.									
All mothers.....		1,618	1,316	239	50	8	2	1	1
Births:									
1.....	448	404	44	---	---	---	---	---	---
2.....	310	279	29	2	---	---	---	---	---
3.....	225	183	37	3	2	---	---	---	---
4.....	157	125	25	7	---	---	---	---	---
5.....	115	88	23	4	---	---	---	---	---
6.....	89	67	13	7	1	---	1	---	---
7.....	73	50	14	8	1	---	---	---	---
8.....	52	36	11	4	1	---	---	---	---
9.....	36	24	10	2	---	---	---	---	---
10.....	35	20	11	2	1	1	---	---	---
11.....	26	12	6	6	2	---	---	---	---
12.....	20	13	5	1	---	1	---	---	---
13.....	13	7	5	1	---	---	---	---	---
14.....	9	3	3	2	---	---	---	---	1
15.....	3	2	1	---	---	---	---	---	---
16.....	6	2	3	---	---	---	---	1	---
18.....	1	1	---	---	---	---	---	---	---
Native mothers.....		540	463	68	7	1	---	1	---
Births:									
1.....	194	175	19	---	---	---	---	---	---
2.....	122	113	9	---	---	---	---	---	---
3.....	93	76	16	1	---	---	---	---	---
4.....	40	32	6	2	---	---	---	---	---
5.....	32	25	6	1	---	---	---	---	---
6.....	25	18	5	1	---	---	1	---	---
7.....	14	10	3	---	1	---	---	---	---
8.....	6	4	2	---	---	---	---	---	---
9.....	5	5	---	---	---	---	---	---	---
10.....	3	2	1	---	---	---	---	---	---
11.....	4	2	1	1	---	---	---	---	---
13.....	1	---	1	---	---	---	---	---	---
14.....	1	1	---	---	---	---	---	---	---
Foreign-born mothers.....		1,078	853	171	43	7	2	---	1
Births:									
1.....	254	229	25	---	---	---	---	---	---
2.....	188	166	20	2	---	---	---	---	---
3.....	132	107	21	2	2	---	---	---	---
4.....	117	93	19	5	---	---	---	---	---
5.....	83	63	17	3	---	---	---	---	---
6.....	64	49	8	6	1	---	---	---	---
7.....	59	40	11	8	---	---	---	---	---
8.....	46	32	9	4	1	---	---	---	---
9.....	31	19	10	2	---	---	---	---	---
10.....	32	18	10	2	1	1	---	---	---
11.....	22	10	5	5	2	---	---	---	---
12.....	20	13	5	1	---	1	---	---	---
13.....	12	7	5	---	---	---	---	---	---
14.....	8	2	3	2	---	---	---	---	1
15.....	3	2	---	---	---	---	---	---	---
16.....	6	---	3	1	---	---	---	---	---
18.....	1	1	---	---	---	---	---	1	---

Order of pregnancy and age of mother.—The relative importance of order of pregnancy and age of mother as factors in infant mortality has never been established.

It is interesting to compare the data for all pregnancies shown in the next table with those presented in Tables 19 and 21, which relate to the babies born during the selected year. Infant mortality rates do not show an absolutely regular trend from one pregnancy to the next, or from one age group to the next, any more than when based upon births during the selected year, but by making comparisons of

three the general tendency to a higher infant mortality rate among born children is shown.

Pregnancy and age of mother.	Births and infant deaths, all pregnancies.					
	Total births.	Live births.			Stillbirths.	
		Total.	Infant deaths.		Number.	Per cent. ¹
			Number.	Infant mortality rate. ¹		
Pregnancies, all ages.....	6,061	5,887	1,029	174.8	174	2.9
.....	422	415	100	241.0	7	1.7
.....	2,031	1,972	366	185.6	59	2.9
.....	1,860	1,816	284	156.4	44	2.4
.....	1,065	1,037	161	155.3	28	2.6
.....	530	510	90	176.5	20	3.8
.....	142	130	22	169.2	12	8.5
.....	11	7	6	.....	4	.....
Pregnancy, all ages.....	1,631	1,574	274	174.1	57	3.5
.....	324	319	71	222.6	5	1.5
.....	877	844	145	171.8	33	3.8
.....	328	315	43	136.5	13	4.0
.....	79	73	11	.....	6	.....
.....	20	20	2	.....	.....	.....
.....	2	2	1	.....	.....	.....
.....	1	1	1	.....	.....	.....
Pregnancy, all ages.....	1,178	1,151	189	164.2	27	2.3
.....	80	78	23	.....	2	.....
.....	621	609	108	177.3	12	1.9
.....	353	346	44	127.2	7	2.0
.....	102	96	12	.....	6	5.9
.....	19	19	2	.....	.....	.....
.....	2	2	.....	.....	.....	.....
.....	1	1	.....	.....	.....	.....
Pregnancy, all ages.....	868	847	149	175.9	21	2.4
.....	16	16	6	.....	.....	.....
.....	330	320	66	206.3	10	3.0
.....	370	364	55	151.1	6	1.6
.....	114	111	16	144.1	3	2.6
.....	33	32	4	.....	1	.....
.....	3	3	1	.....	.....	.....
.....	2	1	1	.....	1	.....
Pregnancy, all ages.....	641	626	122	194.9	15	2.3
.....	2	2	.....	.....	.....	.....
.....	139	136	32	235.3	3	2.2
.....	320	312	57	182.7	8	2.5
.....	137	136	26	191.2	1	.7
.....	38	36	4	.....	2	.....
.....	1	1	.....	.....	.....	.....
.....	4	3	3	.....	1	.....
Pregnancy, all ages.....	475	465	73	157.0	10	2.1
.....	45	44	10	.....	1	.....
.....	231	230	38	165.2	1	.4
.....	141	137	18	131.4	4	2.8
.....	49	46	7	.....	3	.....
.....	8	8	.....	.....	.....	.....
.....	1	.....	.....	.....	1	.....
Pregnancy, all ages.....	361	352	53	150.6	9	2.5
.....	13	13	3	.....	.....	.....
.....	146	142	23	162.0	4	2.7
.....	147	145	20	137.9	2	1.4
.....	48	47	6	.....	1	.....
.....	6	5	1	.....	1	.....
.....	1	.....	.....	.....	1	.....

¹ Not shown where base is less than 100.

Age group	Number of cases
0-4	10
5-9	15
10-14	20
15-19	25
20-24	30
25-29	35
30-34	40
35-39	45
40-44	50
45-49	55
50-54	60
55-59	65
60-64	70
65-69	75
70-74	80
75-79	85
80-84	90
85-89	95
90-94	100
95-99	105
100+	110

Plural births.—Of the total number of pregnancies 64 resulted in live-born twins and 1 each in stillborn twins and in stillborn triplets. In *Natality and Fecundity*¹ it is stated that the frequency of twins in Scotland in 47 consecutive years from 1855 to 1901 amounted to 11.7 per 1,000 confinements. In Manchester, among the 1,618 mothers reporting the results of 5,994 confinements, the twin pregnancies numbered 10.8 per 1,000.

Exactly half of the 128 live-born twin infants died in infancy. This infant mortality rate of 500 among them, as compared with a rate of 174.8 for all births at all pregnancies and 167.6 for single births at all pregnancies, conforms with the usual findings in foreign countries as regards the high infant mortality among twins.

Age of mother.	Plural births resulting from all pregnancies.					
	Total plural births. ¹	Live births.			Stillbirths.	
		Total.	Infant deaths.		Number.	Per cent. ²
			Number.	Infant mortality rate. ³		
All mothers.....	133	128	64	500.0	5	3.8
Under 20.....	10	10	6	.....	.....	.....
20 to 24.....	38	36	17	.....	2	.....
25 to 29.....	36	36	15	.....	.....	.....
30 to 34.....	20	18	10	.....	2	.....
35 to 39.....	21	20	12	.....	.....	.....
40 and over.....	6	6	2	.....	1	.....
Not reported.....	2	2	2	.....	.....	.....

¹ Twins resulted from 65 pregnancies and triplets from 1 pregnancy.

² Not shown where base is less than 100.

Nationality of mother.—A classification of the 6,061 babies by nationality of mother showed a higher infant death rate among babies of foreign-born mothers than among babies of native mothers, and also higher rates for the French-Canadian and Polish than for other foreign groups. This same tendency existed when the comparison was limited to infants born during the selected year to these mothers. The rate was 141.8 for natives and 185.4 for all foreign born. The percentage of stillbirths among foreign-born mothers, however, was only 2.8, a percentage lower than that shown for native mothers, which was 3.2. This outcome may have been due to incomplete data on stillbirths, inasmuch as the proportion of stillbirths reported for all mothers was low. (See Table 53.)

¹ Lewis, C. J. and J. Norman, *Natality and Fecundity*, London, 1906, p. 63.

TABLE 53.

Nationality of mother.	Total mothers.	Births and infant deaths, all pregnancies.					
		Total births.	Live births.			Stillbirths.	
			Total.	Infant deaths.		Number.	Per cent.
				Number.	Infant mortality rate.		
All mothers.....	1,618	6,061	5,887	1,029	174.8	174	2.9
Native mothers.....	540	1,479	1,432	203	141.8	47	3.2
Foreign-born mothers.....	1,078	4,582	4,455	826	185.4	127	2.8
French-Canadian.....	601	2,905	2,815	583	207.1	90	3.1
Polish.....	167	525	517	90	174.1	8	1.5
English, Irish, and Scotch..	111	514	497	63	126.8	17	3.3
Greek and Syrian.....	72	191	187	25	133.7	4	2.1
German.....	30	123	119	18	151.3	4	3.3
Jewish.....	24	114	111	16	144.1	3	2.6
All other and not reported..	73	210	209	31	148.3	1	.5

Economic status.—The economic status of the family for the whole period covered by the maternal history was assumed to be indicated, roughly at least, by the amount the father earned in the year following the birth in the selected year. This assumption without doubt is erroneous in individual cases, but it is believed that for the majority of families the earnings of the father did not change sufficiently from year to year to produce a radical change in the standard of living.

The results show, for all mothers, a decline in the infant mortality rate accompanying the advance in economic status with one exception. The infant mortality rate among babies whose fathers earned under \$550 a year was 184.4, while the rate for babies in the next class, whose fathers earned \$550 to \$649, was somewhat higher—195.3; but this exception does not disturb the trend. In the succeeding classes the infant mortality rate decreased steadily, and the rate in the highest economic class, where fathers earned \$1,250 and over, was only 99.3. It is apparent that the same general relation between economic status and the infant mortality rate is revealed here that was found in the analysis of the rate for the babies born during the selected year. The assumption involved in the determination of economic status for the larger group of babies makes the figures presented for them less reliable than those shown for the babies born during the selected year.

Age and nativity number.	Total mothers.	Births and infant deaths, all pregnancies.					
		Total births.	Live births.			Stillbirths.	
			Total.	Infant deaths.		Number.	Per cent. ¹
				Number.	Infant mortality rate. ¹		
.....	1,618	6,061	5,887	1,029	174.8	174	2.9
.....	493	1,916	1,866	344	184.4	50	2.6
.....	292	1,108	1,065	208	195.3	43	3.9
.....	419	1,618	1,574	288	183.0	44	2.7
.....	198	1,668	647	90	139.1	21	3.1
.....	72	268	261	27	103.4	7	2.6
.....	103	307	302	30	99.3	5	1.6
.....	21	87	84	25	.....	3	.....
.....	20	89	88	17	.....	1	.....
.....	540	1,479	1,432	203	141.8	47	3.2
.....	87	238	226	36	159.3	12	5.0
.....	90	241	232	52	224.1	9	3.7
.....	157	475	465	62	133.3	10	2.1
.....	100	262	254	32	126.0	8	3.1
.....	36	98	93	8	.....	5	.....
.....	61	145	143	8	55.9	2	1.4
.....	5	7	6	2	.....	1	.....
.....	4	13	13	3	.....	.....	.....
.....	1,078	4,582	4,455	826	185.4	127	2.8
.....	406	1,678	1,640	308	187.8	38	2.3
.....	202	867	833	156	187.3	34	3.9
.....	262	1,143	1,109	226	203.8	34	3.0
.....	98	406	393	58	147.6	13	3.2
.....	36	170	168	19	113.1	2	1.2
.....	42	162	159	22	138.4	3	1.9
.....	16	80	78	23	.....	2	.....
.....	16	76	75	14	.....	1	.....

where base is less than 100.

¹ Includes 1 father living on his income.

Family and infant mortality.—The relation between the infant mortality rate and the size of the family or number of children is a point upon which the maternal histories offer the fullest and most reliable data. All pregnancies excepting those resulting in miscarriage are considered. A marked difference in the infant mortality rate is revealed according to the number of such pregnancies, or, as a rule, the rate increased with the number of children born to a mother who had given birth, though this tendency was not altogether from one number to the next. That is, a rise in the infant mortality rate did not accompany each single increase in the size of the family.

A general underlying tendency toward a higher infant mortality rate in larger families is revealed when a classification of the number of children born to a mother is made by groups of three. This, with one exception, is accompanied by a regular increase in the infant mortality rate from the smallest number to the largest. The infant mortality

rate, according to the number of children, were: children of all families who have borne 4 children, 138.7; for children of families who have borne 5 children, 132.9; 7 to 9 children, 133.5; in families of 10 or more children, 141.1, and in families of 12 or more children, 141.1. Seven families had had more than 15 children; the mortality rate for this group presents an exceptional tendency of the rate to be higher in large families to 149.5. Inasmuch as the numbers involved here, thus far, of the other groups compared, there is great significance.

In the whole, then, although the infant mortality variations noted, the general tendency toward a high rate in the larger families is clearly established.

TABLE I

Infant mortality

Family size	Infant mortality
1 child	138.7
2 children	132.9
3 children	133.5
4 children	141.1
5 children	141.1
6 children	149.5

Family size	Infant mortality
1 child	138.7
2 children	132.9
3 children	133.5
4 children	141.1
5 children	141.1
6 children	149.5

Family size	Infant mortality
1 child	138.7
2 children	132.9
3 children	133.5
4 children	141.1
5 children	141.1
6 children	149.5

Out of a total of 32 mothers who had had more than 12 children 30 were French Canadians. Mothers of 10 children and over among French Canadians formed 14.6 per cent of the whole number, while among all other foreign-born mothers the percentage who had had this number of children was 3.4. Only 1.7 per cent of the native-born mothers had had as many as 10 children.

General discussion of maternal histories.—In addition to furnishing the basis for the few broad generalizations given above the maternal histories offer a wealth of concrete material. These histories take the family as a unit, but within this small unit may be represented many of the adverse conditions which cause the infant mortality in the community as a whole. The method pursued in the study of infant mortality for the community was to seek for coincidences between a high infant death rate and specific adverse conditions. To portray the conditions found in certain families which suffered a large number of infant deaths is the purpose of this section. These statements do not furnish proof that the conditions portrayed are responsible for the deaths cited, but they do serve to make more vivid some of the evils accompanying a high infant death rate already pointed out in the statistical analysis.

The stories of the mothers which follow are arranged for convenient reference according to the number of births the mother has had. Since these records are not given as typical a case table is submitted, which shows the exact distribution of stillbirths and infant deaths among all mothers classified by the number of children they have borne and the number of years they have been married. By referring to this table it is possible to determine the extent to which any case cited is representative of the group as a whole. The causes of death assigned to babies other than those born during the selected year and included in the detailed study are based on the statements of the mothers unless otherwise indicated in the text. The cause of death of the last born child, however, is that reported by the physician on the death certificate. Methods of feeding and the exact length of time when the mother ceased work before the birth of a child or resumed it afterwards are reported only for the last baby.

ILLUSTRATIVE CASES.

Schedule 993: The mother, 41 years old, had had 12 children (11 pregnancies) in 22 years. She lost 8; 1 was stillborn at 7 months and the others all died in infancy. Four children, including the last, were living at the time of the agent's visit. The mother worked 2 years before marriage in a cotton mill and 19 years after marriage between pregnancies. She had not worked for wages for the last three years. The father also was a cotton-mill operative. His earnings were \$710 from this source during the year after the last baby's birth, but these were increased \$300 from canvassing during his spare

time. Both parents were literate and were intelligent, hard working, and thrifty. The home would have been good had it not been that smoke and soot from a smokestack near by blew into the back windows and made it difficult to keep the home clean.

Schedule 1287: The mother, 41 years of age, had had 12 children in 22 years, of whom 5 died during their first year from diarrhea. She never had been able to nurse any of her babies but fed them on cows' milk. She was an "old-fashioned" mother who used her own mother's household remedies when her children were sick, and called the doctor only when these failed. She worked in a cotton mill from the age of 14 until she was 20, when her first baby was born. The baby's father is a laborer who earned \$624 the year after the last baby's birth, but the family income was increased \$1,500 by the earnings of older children.

Schedule 120: The mother was 42 years old, twice married, at 18 and at 27 years of age, respectively. In all she had 13 pregnancies, 12 of which occurred in the last 14 years. One, she said, resulted in a miscarriage caused by heavy lifting. Seven children died in infancy; 5, including the last baby, from gastrointestinal troubles. The mother had worked in the cotton mill 3 years before her first and 5 years before her second marriage, but never since. The husband was employed in a cigar factory and reported his earnings at \$546 during the year after the birth of the last baby.

Schedule 206: The mother, 38 years of age, had 13 pregnancies in 20 years. These included 1 pregnancy of twins, which resulted in miscarriage. Among the live-born children had occurred 4 infant deaths and 1 death at 2 years of age. The last baby died in the third month, of cholera infantum. The mother, on the doctor's advice, had resorted in part to artificial feeding with this baby, because her own milk was insufficient. She did all her own housework and resumed it 6 days after the last baby was born. As a girl from 13 to 18 she helped with farm work, but never worked in a factory until after the death of the last baby, when she went into the cotton mill. The father was a cotton-mill employee earning \$481 the year after the last baby was born. The home contained only 5 rooms for 9 people.

Schedule 194: The mother, 41 years old, in 21 years had had 12 pregnancies, 11 live-born children and 1 miscarriage. Four children died in infancy, the last of whooping cough and convulsions at 11 months. The mother had no breast milk for this baby, and after the second month she left it in the care of the baby's older sister, aged 17, while she went out to work by the day. Before marriage and up to the time of the birth of her first baby she had worked in a woolen mill. Since that time she had not been gainfully employed until the last year, when she went out by the day at char work. The father's earnings the year after the baby's birth he reported to be approximately \$414.

Schedule 84: The mother, 35 years of age, married at 16 and had 11 children in 19 years. She lost 7 of these under 1 year of age. For the last 2 years she kept lodgers in addition to her millwork, and

did not cease work at all prior to the birth of the last baby, which was born prematurely and died the first day. She resumed her household tasks 3 days after its birth and her millwork in 2 weeks. The mother attributed the loss of the last child to hard work and worry. Her husband had deserted her several times, and she had been the chief support of the family. He contributed nothing to the family's support the year after the birth of the last baby. She had worked in the cotton mill for the last 8 years, with brief intermissions at the birth of each child.

Schedule 183: The mother was 38 years old, married at 18, and bore 11 children in 20 years. Five died in infancy, 3 of digestive troubles. The last baby was artificially fed from birth because of the mother's lack of milk; it died of cholera infantum in the eighth month. The mother had worked in the cotton mill since the age of 12. After marriage she worked intermittently, chiefly during slack seasons in her husband's employment in the shoe factory. She worked until within 6 months of the birth of the last baby and went back to work in the mill 1 month after. The baby was left in the care of its grandmother while the mother was away at work. Home duties were resumed in part 3 days after the baby's birth. The home consisted of 4 rooms for 8 people in a 4-family tenement. Apart from room overcrowding, conditions were not bad.

Schedule 1195: The mother, 41 years of age, was married twice, the first time at 16 years of age and the second at 36. She had 8 children in 15 years by the first marriage and 3 in 5 years by the second. All were live born, 3 died in infancy, and 1 at 14 months. Two died of digestive troubles. The last baby was living at the time of the agent's visit. The mother had never attempted to nurse it, because she had to go to work. It was left in the care of an older sister from its second month. This mother did not work before marriage, but since marriage has been almost continuously employed between confinements. From 16 to 21 years of age she worked as housemaid; after that in a cotton mill; since her second marriage, in addition to millwork she has kept lodgers. She worked in the mill until 1 month before the last baby was born and went back a month later. She began to do her housework and to care for the lodgers 9 days after confinement. The husband was a painter, whose earnings the last year were \$468. He could not read and write.

Schedule 1209: The mother, 37 years of age, had 11 children in 19 years. She was again pregnant at the time of the agent's visit and had to cease nursing her last baby at 5 months of age on this account. Three children had died in infancy, 2 of cholera infantum. The mother began work in a cotton mill at the age of 13 and worked regularly until marriage. After marriage she continued to work in the mill at intervals. During the year previous to the birth of the last baby she had worked 6 months, but none in the year following. She was unable to read and write. The father's earnings were reported to be \$832.

Schedule 1305: The mother was 29 years of age. She married at the age of 14 and had 11 children in 15 years. Of these 2 died

under 1 year, 3 between the ages of 1 and 2, and 1 at 2 years. Four deaths, including that of the last baby when 15 months old, were due to gastrointestinal diseases. The last baby had been artificially fed after 2 months because the mother had no more milk. The mother went to work in a cotton mill at the age of 13 and worked until she was 16, when her first baby was born. Since then she has continued to work intermittently between confinements, generally for about 6 months out of each year. She ceased work 7 months before the birth of the last baby and did not resume millwork during the year after. The husband was a shoe operative, with earnings of \$550 in a year. The home consisted of 4 rooms for 7 people.

Schedule 1306: The mother, 38 years old, had 11 children in 14 years. The first 6 all died, 5 in infancy and 1 at the age of 13 months. The last baby had to be weaned after the second month because the mother was weak and had no milk. She did all her own housework, including washing, and took up these duties 5 days after the birth of the last baby. She never worked for wages, however. The father was an unskilled employee in a cotton mill, whose earnings the year after the birth of the last baby were reported at \$529. Both parents were illiterate.

Schedule 338: The mother, 44 years of age, had 11 pregnancies (twins once) in 21 years. Among these there had been 1 miscarriage, 3 infant deaths, and 1 death at 1 year. The last were twins, born prematurely and dying shortly after their birth. This mother began work in a cotton mill at the age of 12 and worked until 18. The next 2 years she worked as a waitress and then returned to the cotton mill until her marriage at 23. During her 21 years of married life she had gone out to work at charring irregularly. She ceased to work out 6 months before the birth of the last baby and did not resume work until 11 months afterwards. The husband was a carpenter whose earnings the year after the birth of the twins were reported at \$775. The home consisted of 4 rooms for 9 persons in a 12-family tenement.

Schedule 198: The mother, 47 years of age, married at 27 and had 13 pregnancies in 20 years. Three resulted in miscarriages and 1 in stillbirth. The mother thought her milk not nourishing and did not nurse the last baby but fed it on a prepared infant food, which, however, failed to agree with the baby, who died in its fourth month of marasmus. This mother worked in a mill 13 years before marriage, from the age of 12 to 25, but never since. Her husband earned over \$1,250 a year.

Schedule 207: The mother was 37 years of age. Ten children (twins at seventh pregnancy) were born in 18 years, 4 of whom died in infancy, 3 of them of gastrointestinal diseases. The mother was unable to nurse the last baby because she had no milk. She said her children were born weak because of her overwork. She first went to work at the age of 14, in a cotton mill, and worked regularly until marriage at the age of 19. After marriage she worked between confinements. She ceased to work in the mill 3 months before the birth of the last baby and went back to her work when

the baby was 3 months old. The child was left in the care of its grandmother, 75 years old, and died 6 weeks later. The father worked in a cotton mill also, and his earnings during the year following the birth of the last baby were approximately \$424. Both parents were illiterate.

Schedule 226: The mother, aged 37, had 11 pregnancies in 19 years, 1 resulting in a miscarriage and 3 in stillbirths. The last 2 children died in infancy, 1 at 3 weeks and 1 at 15 days, of spina bifida. The mother said she had lost these 2 and had had the miscarriage and stillbirths because of "something wrong with the spine." She worked a year in a cotton mill before marriage and occasionally since, but was not gainfully employed the year preceding or following the birth of the last baby. The father was a cotton-mill employee, earning \$475 the year after the birth of the last baby. Both parents were illiterate.

Schedule 1590: The mother was 33 years old when her last baby was born, and in the 15 years of her married life had borne 10 children. Both of the twins which preceded the last baby had died, 1 at 3 months and 1 at 5 months, and the mother said they were always sickly. The last baby was entirely breast fed for 6 months, but during the remainder of the first year the mother's milk was supplemented by other food. The mother had worked as weaver in a textile mill for a year and a half before marriage. After marriage she continued this work for a year and resumed it for 4 months between the births of her first two children. After leaving the mill before the birth of her second child she kept lodgers for 13 years, but the year before the last baby's birth she ceased all gainful employment. This family of 9 persons lived in their own house of 7 rooms. The mother had done all her own housework up to the day of the last baby's birth, but did not resume all her duties until 1 month afterwards. The father was a retail salesman. His earnings were only \$210, but the family income was increased by the rent from another house which they owned.

Schedule 885: The mother, 38 years of age, had 10 children (9 pregnancies) in 17 years. All were live born. The twins, however, were born prematurely and died in a few minutes. Four other children died at ages ranging from 1 to 6 years. The mother had worked in a cotton mill 6 years before marriage, from the age of 15 to 21, and irregularly afterwards. She worked 8 months of the year preceding the last baby's birth and resumed work 9 months after its birth, leaving the baby in the care of a neighbor. This baby was alive at 1 year of age. The husband was a laborer, earning \$418 the year following the birth of the last child. This income was increased by the mother's earnings.

Schedule 984: The mother, 35 years of age, had 11 pregnancies in 14 years—1 miscarriage and 10 live-born children. One child was born prematurely after a period of 7 months gestation and died when a few days old. Three other children died in their first year, 2 at 6 and 1 at 4 months of age. Six children, including the last baby, were surviving at the time of the agent's visit. The mother went

to work in a cotton mill at the age of 15 and worked there until marriage at the age of 21. Since marriage her only gainful work has been the keeping of lodgers. The father, a shoe operative, reported his earnings as \$713. He was unable to read and write.

Schedule 1486: The mother was 41 years of age. She had 10 children in 17 years; 2 were stillborn and 2 had died in infancy. The mother went to work at the age of 13 in a silk mill. She worked there for 8 years prior to marriage. After marriage she was not gainfully employed until after the birth of the last baby. At this time she worked in a cotton mill from the baby's third to its ninth month, leaving it in the care of its 15-year-old sister. While thus at work she continued nursing the baby, feeding it in the morning, at noon, and at night. The father was a laborer earning \$400 in a year.

Schedule 1663: The mother was 40 years of age and had 11 pregnancies, including 1 miscarriage and 1 stillbirth, in 22 years. Three children died in infancy and 6 were surviving at the time of the agent's visit. The mother had worked in a cotton mill between the ages of 14 and 18. Since marriage she worked out irregularly, at washing and cleaning. She was employed at this work until within a month of the birth of the last baby, but had not engaged in it since. The father was a cotton-mill employee, earning \$582 during the year following the birth of the last baby. The family owned their home, a 6-room cottage, but conditions around it were insanitary. The father had dug a hole in the ground for a cesspool. At the time of the agent's visit this was filled and overflowing a drain into a pool in the garden, about 15 feet from the house. Though there was no sewer connection, the house had city water.

Schedule 161: This mother, 36 years of age, had 10 pregnancies in 15 years. Every one of her children excepting the fourth was born prematurely after a 7 months' period of gestation. The third pregnancy resulted in a miscarriage at 6 months. Three children died in early infancy. The mother suffered from long labors and atony of the uterus. She never was engaged in gainful employment and received assistance with her housework to the extent of having her laundry work done. The husband was a teamster who earned \$702 a year, and this was supplemented by income from property.

Schedule 220: The mother was 49 years of age and had 11 pregnancies in 23 years. These included 3 miscarriages and 9 live-born children. One child died at 3 years of age, and 1, the last, at 11 months. The mother attributed all her miscarriages to her weakness from overwork. The mother weaned the last baby at the end of the first month in order to go to work in the mill. She had worked in the mill 4 years before marriage at 26 years of age and continued intermittently after marriage, averaging 7 months a year. She ceased her millwork only 2 months before the birth of the last baby and resumed it 1 month after, leaving the baby in the care of a 12-year-old sister. She had partially resumed her household duties 3 days after the baby's birth. The husband worked in

factory where his earnings the year after the birth of the last child had averaged about \$10 per week. The home, 6 rooms for 8 people in a 4-family rear tenement, was dark and without adequate air.

Schedule 236: The mother was 37 years of age. She had 12 pregnancies in 17 years, 3 of which resulted in miscarriages. Three children died, only 1, however, the last, in infancy. This baby died at 7 months of gastroenteritis. The mother had nursed it 4 months, but ceased then, by the doctor's advice, she said, because the baby was sick. The baby was thereafter fed upon condensed milk. The mother worked in the cotton mill 7 years in all, including the first year after marriage. For the last 2 years she was gainfully employed at home taking care of children while their mothers were away at work. The father was a laborer and earned the year after the birth of the last baby only \$260. This was increased by the earnings of others in the family. Neither parent could read or write. The home consisted of 4 rooms for the 8 members of the family, and during the day the 3 children of neighbors of whom the mother had charge.

Schedule 468: The mother was 34 years old. She married at 15 and in 19 years had 13 pregnancies, including 4 miscarriages. She lost 1 baby at 7 months from cholera infantum. The last baby was living at the time of the agent's visit and had been artificially fed from birth because the mother had no milk. The mother worked irregularly after marriage at cleaning and char work, and also for a few months in a shoe factory. She was not, however, gainfully employed either during the year preceding or the year following the birth of the last baby. The father was a day laborer. His earnings the last year he reported at \$250, supplemented by \$350 from other sources.

Schedule 244: The mother was 37 years of age and had 9 children in 17 years, 2 of whom she lost at 4 years of age. The last baby died of cholera infantum at 5 months. This baby was weaned at the end of 5 weeks because the mother had to go to work. The mother's earnings were the sole support of the family, which was deserted by the father. She had worked until within 1 month of the birth of the last baby and resumed this work 5 weeks after, leaving the baby in care of an aunt. The home was a 4-room apartment for 7 persons in an 8-family rear tenement.

Schedule 35: The mother, aged 35, had 10 pregnancies in 13 years. Two resulted in miscarriages and 1, the last, in a still-birth. Three babies died in infancy, all of cholera infantum. The premature deliveries the mother and doctor both attributed to overwork. The mother worked in a cotton mill until within 3 weeks of the birth of the last baby, and had averaged about 7 months' work a year between confinements. She worked for 8 years previous to her marriage, beginning at the age of 14. The father also worked in the cotton mill, and his earnings the year following the birth of the last baby were \$550. The mother did not work during this period. The home consisted of a poorly ventilated 4-room apartment for 6 people in a 3-family house in the congested section. The mother could read and write, but the father could not.

Schedule 690: The mother was 36 years of age and in 16 years she had 8 pregnancies, all resulting in live births. She lost 2 babies in infancy and 1, the last, died in its thirteenth month of infantile paralysis. Three children were surviving at the time of the agent's visit. The mother did not know the cause of death of her babies—"they just died." She had not been able to nurse the last baby. This mother had worked in a textile mill 6 years previous to marriage, from the age of 14 to 20, and in a woolen mill at intervals since marriage, aggregating about 55 months. She worked until within 3 months of the birth of the last baby, but not since. The husband was an operative in a textile mill, earning \$470 the year after the last baby's birth. He could not read and write; the mother was literate. The home consisted of 4 rooms in a 5-family tenement in a congested section of the city. The toilet was used in common with other families in the house.

Schedule 867: The mother was 37 years of age. She married at 15 and had 9 pregnancies, 1 of which terminated in a miscarriage caused, the mother thought, by overwork. Three children died in infancy. Five children, including the last, were living at the time of the agent's visit. This baby had never been nursed, however, because the mother intended to go to work. She had gone out to work for wages since the birth of her last 2 children, 7 years in all. She worked intermittently in a cotton mill during this period, and for the last 2 years had, in addition, kept 1 or 2 lodgers. The year previous to the birth of the last baby she worked in the cotton mill 9 months, until within 2 months of its birth. She returned to work 3 months after, leaving the baby in the care of a sister, aged 13, or of another girl aged 16. The father was a cotton mill operative, earning about \$500 a year.

Schedule 1059: The mother, 35 years of age, in 13 years had 10 pregnancies, 6 of which resulted in miscarriages. She lost 1 baby at 7 weeks of age, 1 at 16 months, and 1 at 18 months, all of diarrhoea. The miscarriages, she said, the doctor attributed to her weakness caused by her work in the mill. Previous to marriage she had been employed as a cotton-mill operative 6 years (from the age of 16) and at intervals since marriage. She had not worked, however, during the year before or following the birth of the last baby. The mother weaned this baby at 4 months because she had again become pregnant, the fifteenth pregnancy. The father's earnings the year following the birth of the last baby were \$540. Neither father nor mother could read and write.

Schedule 1336: The mother, 32 years of age, had married at 16. She had 11 pregnancies, including 3 miscarriages, in 16 years. The miscarriages were attributed by the mother to "weakness," and in one case to a fall. One child died at 6 months, 1 at 1 year of gastric intestinal trouble, 1 at 18 months of convulsions, and 1 as the result of burns; the last baby was living at the time of the agent's visit. The mother had done general housework for 2 years, from the age of 14 to 16. After marriage at 16 she started to work in a cotton mill where she had worked at intervals ever since. She ceased work on

2 months prior to the birth of the last baby, but did not work during the year following. The husband was a cotton-mill employee whose earnings the year after the baby's birth were \$900.

Schedule 1088: The mother, aged 26, married at 16 and had 8 pregnancies in 10 years. All her children were live born, but she had lost 3 in infancy and 1 at 5 years. Two died at 3 months of cholera infantum, and the other 2 deaths were from pneumonia. Four children, including the last baby, were surviving at the time of the agent's visit. The last child had been artificially fed from birth, because the mother had no milk. This mother had worked in a textile mill since the age of 11, a period of 5 years previous to marriage, and irregularly since. She was not engaged in gainful employment, however, either the year preceding or that following the birth of the last baby. The father's earnings for the year after the last baby's birth approximated \$776. The father could read and write, but the mother could not.

Schedule 1184: The mother was 34 years of age. She had 11 pregnancies in 12 years. Three of these terminated in miscarriages. There were 8 children live born, but 3 died in infancy. The last baby, which was surviving at the time of the agent's visit, was weaned at 2 months because the mother had again become pregnant. This mother worked 6 years, previous to marriage—3 years at domestic service and 3 years as a shoe operative. She had also worked intermittently since marriage, though not during the last 6 years. Her husband was a retail salesman with annual earnings of \$725, which were supplemented by \$120 from other sources.

Schedule 1192: The mother, 36 years of age, had 10 pregnancies in 16 years, 2 of which terminated in miscarriages at 5 months and 2 in stillbirths at 7 months. One child was born prematurely at 8 months and died on the first day; another died at 17 days of diphtheria. Four children, including the last, were surviving at the time of the agent's visit. The last baby, however, had been ill of scrofula since 5 months of age; its eyes had been sore since birth, so that it had to be kept constantly in a dark room. The mother had been compelled to wean this baby when it was 1 week old because she had no strength to nurse it. She resumed part of her household duties in 5 days after the baby's birth and all of them 10 days later. The mother had been gainfully employed as housemaid for 4 years previous to marriage, but had not worked since. The father was a cotton-mill operative and earned \$416, supplemented by \$260 from other sources. The home consisted of 3 rooms in a 4-family tenement in the congested section of the city. This family consisted of 5 people. Twelve people in all used the toilet.

Schedule 1222: The mother, 30 years of age, had been married at 17 and had 9 pregnancies in 13 years. One terminated in a miscarriage at 4 months, and 1 baby, prematurely born at 8 months, died shortly after birth. Another child died at 3 months of whooping cough, and 3 children at 3, 5, and 10 years, respectively, of tuberculosis, of whooping cough, and of pleurisy. The mother had childbed fever at the birth of the last baby and so was not able to nurse

it. This baby and 2 other children were surviving at the time of the agent's visit. This mother had begun work in a cotton mill at the age of 10, where she worked for 9 years, including 2 years after marriage, but she had not subsequently engaged in gainful employment. The annual earnings of the father were reported by the mother to be over \$1,250. The mother was literate, the father illiterate.

Schedule 1547: The mother, aged 36, had 11 pregnancies in 12 years, including 3 miscarriages after 3 months' periods of gestation. The first miscarriage, the mother said, was caused by overexertion; the 2 succeeding miscarriages, the mother reported, were said by the physician to be due to her weakened condition on account of too frequent pregnancies. The mother was careless of her rugged health, and did not spare herself from overexertion. She had not been gainfully employed since marriage, but had worked in a cotton mill from the age of 18 to 24, previous to marriage. The father earned \$1,092 the year following the birth of the last baby. The home consisted of a 7-room 1-family cottage with adequate light and air. It had no sewer connection, and water from the sink was conveyed from the house through an open drain.

Schedule 36: The mother, who was 41 years of age, had 7 pregnancies in 15 years. The first baby died at 2 weeks and the second at 7 years. The last 2 children were stillborn at 7 months because, the physician stated, of the overwork of the mother. The mother had worked in a cotton mill from the age of 16 until marriage and since marriage it had been her practice to work continuously, unless interrupted for childbearing. It was her custom to work until 6 months pregnant and return to work within a few weeks after childbirth. She did not cease her millwork at all previous to the birth of the last baby and resumed work 1 week after. The father, who was a cotton-mill operative, reported his year's earnings at \$562. The mother's earnings were \$360. Neither parent could read or write. The home consisted of 4 rooms for 5 people in a 5-family tenement. The rooms were dark and ventilation poor.

Schedule 213: The mother was 30 years of age, married at 17, and had 7 pregnancies in 13 years. All of her children were born at term, 1 was stillborn, and 1 died within a few minutes after birth; both deaths caused, the mother thought, by overwork during pregnancy. In addition, 2 other children died in infancy, 1 at 8 months of diarrhea, and the other, the last born, at 4½ months of gastroenteritis. This baby had been weaned by the mother when 3 weeks of age, because she wanted to go to work in the mill. She worked until within 2 months of the birth of this child. She resumed her household duties 4 days after the last baby's birth and went back to her millwork 5 weeks after, leaving the baby in the care of its grandmother. This mother had worked in the cotton mill almost continuously since the age of 13. After marriage it had been her custom to cease work 2 months before the birth of each child, and to resume 3 months after the baby's birth. The father, who was employed in the building trades, earned \$630; the mother's earnings increased this to \$1,100 during the year after the baby's birth. The father could not read and write; the mother was literate.

Schedule 339: The mother was 35 years of age and had 8 pregnancies in 13 years, 1 of which terminated in a miscarriage. Of the 7 live-born children 5, including the last born, died under 6 months of age of malnutrition. The last, which died at 5 months, was nursed only for the first 3 weeks, because the doctor told her, the mother said, that her milk was not good. This mother had worked in a cotton mill from the age of 16 to 22 and for a part of the year prior to the baby's birth, ceasing the work 3 months before, but she did not resume work during the year following. The father was a shoe-factory operative. His earnings were \$634 the year following the last baby's birth.

Schedule 1297: This mother, aged 39, had 7 pregnancies in 15 years, 1 resulting in live-born children. She lost the first 4; 3 died in infancy and 1 at 16 months, all from malnutrition. The mother had not been able to nurse the last baby on account of lack of milk. This mother worked in a cotton mill 6 years, previous to marriage, from the age of 18 to 24, and since marriage had kept a store in connection with the home. She ceased none of her work previous to the birth of the last baby, and resumed all of it 6 days after. The father was a laborer, with annual earnings of \$511, and the mother earned \$350. The home consisted of a 6-room cottage.

Schedule 1524: The mother was 30 years of age, and in 6 years had 6 pregnancies, including 2 which resulted in miscarriages at 2 and 4 months. She twice gave birth to twins, born alive but prematurely. Three of the 4 twins died in infancy. The last baby and 3 other children were surviving at the time of the agent's visit. This mother had worked for a period of 5 years previous to marriage, 2 years as bookkeeper and 3 years as chambermaid. Since marriage she had kept lodgers now and then. The father was a factory operative, whose earnings approximated \$800 the year following the birth of the last baby. The mother stated, however, that her husband drank, and gave her money only occasionally, so that her brother was obliged to help.

Schedule 18: The mother was 28 years of age. She had 8 pregnancies in 9 years and lost every child. Two were miscarriages at 3 months and 3 were stillborn at full time. The mother thought the cause of these losses was her overwork and too frequent pregnancies. The physician stated that the mother had tuberculosis. The other children died in infancy. The last child was stillborn because of an accident of labor. This mother had worked in a cotton mill for a period of 5 years previous to marriage, from the age of 14 to 19, and once marriage she had worked between confinements. She ceased work 4 months before the birth of the last baby and resumed 5 months afterwards. The mother stated that this was her usual custom. The father's earnings in a year were \$1,170 and the mother's \$164. The home consisted of 5 rooms in a 4-family tenement and had adequate means of ventilation and sanitary facilities, but the building was old, built close to the ground, and unhealthful because of its dampness.

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The father was a laborer, employed at odd jobs. His earnings the year following the last baby's birth were \$350 and these were supplemented by the mother's earnings, \$333.

Schedule 10: The mother was 39 years of age and had 4 pregnancies in 9 years, 2 of which resulted in the premature birth of stillborn children. One child died at 9 months and 1 was surviving at the time of the agent's visit. This mother worked in the cotton mill from the age of 17 till 21 and also during the years preceding and following the birth of the last baby. She ceased work 1 week prior to the birth of this child, which was stillborn at 8 months, and resumed work 3 weeks after. The father also was an employee in the cotton mill, earning \$600, and the mother earned \$521.

Schedule 1600: The mother had 4 children in 7 years, of whom only the last was living. She began to work in a textile mill at 18 years of age, a year before her marriage, and continued this, with brief interruptions when her first 2 children were born, until she was 24 years old. The first baby died at 1 week of age; the second at 6 months, from measles. The third child lived only 5 minutes. When the last child was born the mother had been doing her own housework and helping in her husband's store until 2 days before the baby's birth, and she resumed these duties when the baby was 1 week old. The family lived in 3 rooms in the rear of the store. The mother nursed her baby throughout the first year. After the seventh month she gave him other food also, because, she said, the doctor advised it. Four other families lived in the building and the toilet was used by 27 persons. The family's income from the store was \$780.

Schedule 258: In the 5 years of her married life this mother, aged 28, had borne 4 children. The first child had died of pneumonia at 18 months and the last baby had died of cholera infantum at 8 months and 17 days. The last baby was breast fed until death. The mother had continued her usual home duties, except laundry work, until the birth of the last baby and resumed them all 2 weeks later. Her family and lodgers, 14 persons in all, occupied 5 rooms in a 2-family house. The home was poorly ventilated and dirty. The father was a textile-mill operative and his earnings during the year following the last baby's birth were \$404, to which was added income from lodgers and other sources.

Schedule 306: The mother was 26 years old and had 3 children in the 4 years of her married life. Only the second child was living. She had worked in a textile mill since she was 19 years old, with intermissions when her first 2 children were born. For a year before the last baby's birth she had not been employed, although she went back to the mill when this baby was 6 months old, leaving him with his grandmother during her absence at the mill. This baby was breast fed until the mother went out to work, when she began to supplement her nursing with other food. A month later she weaned the baby entirely. Both this baby and the first child had died of broncho-pneumonia, the first baby at 21 months and the last at 10

months and 18 days. The father was an engineer earning \$780, and the mother earned \$160. The family lived with 7 other persons in 5 rooms in a 3-family house.

Schedule 313: The mother was 21 years of age and in the 4 years of her married life had 3 children. The last one died of gastro-enteritis just before he was 4 months old. For the first month the baby had mother's milk supplemented by other food, but he was completely weaned at the beginning of the second month. The mother had worked in a textile mill since she was 13 years old. Two months before each baby came she had left the mill, and returned when the baby was 2 months old. The mother had done her housework, except the washing, until the birth of the baby and resumed the housework, in part, 6 days later. A girl of 14 was employed to look after the baby during the mother's absence at the mill. The father was a textile operative. He earned \$383 during the year after the last baby's birth, and the mother earned \$150. They lived in a 5-room flat in an 8-family dwelling.

INFANT MORTALITY.

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[illegible]

ILLEGITIMACY.

The condition of illegitimacy subjects babies to special handicaps which make their welfare a problem somewhat apart from the general problem of infant welfare. Babies born to unmarried parents constitute always an abnormal class and must be dealt with as such. For this reason the schedules secured for them were not included in the general tabulations, but were reserved for separate consideration. (See Table 1.) A record of 44 illegitimate births in Manchester during the period studied was obtained by the agents. Of these, 35 were registered, but of that number complete schedules were obtained in only 11 instances. There were 21 who could not be found or had moved out of town and 3 whom it seemed unwise to visit. The scope of the investigation was not such as to warrant taking the measures necessary to obtain full information regarding either the total number of illegitimate births or the circumstances surrounding all those which were known. The data obtained are recognized as incomplete but are presented for what interest they may have.

Among the 44 babies of illegitimate birth 14 died in infancy and 7 were stillborn. The births were nearly evenly divided between native and foreign-born mothers.

Records of the State board of charities relating to the infant asylum in Manchester, which receives foundlings and dependent babies, are of interest in this connection.

Thirty-two Manchester infants under 1 year of age were received into the asylum during the period covered by this investigation. Of these, 15 were reported as of legitimate birth, 16 as illegitimate, and one as unknown. Among the babies at the asylum 14 infant deaths occurred—8 illegitimate babies, 5 babies born in wedlock, and 1 child whose parentage was unknown. The county hospital also had records of 12 babies born there during the period in question whose mothers were from Manchester, and of these 9 were illegitimate. These three groups (that is, the 44 illegitimate births discovered by this investigation, the 9 illegitimate births recorded at the county hospital, and the 16 babies of illegitimate birth received by the infant asylum) probably overlap to some extent, so that it is not possible to deduce from these figures any conclusions as to the number of babies of illegitimate birth born during the selected year.

ENVIRONMENT.

Bad housing, congestion, and insanitary conditions in general, such as dirty streets, defective sewerage, and inadequate or impure water supply are generally regarded in studies of infant mortality as being important factors. These conditions were acute in some parts

of Manchester, but were not extensive. In so far as they did exist, however, there is evidence that they had the same association with high infant mortality rates here as elsewhere. In the central portion of the city were some bad housing areas and congested sections and in the tenement houses agents found many dark rooms as well as dark unventilated toilets.

Though the data presented on housing and sanitation are somewhat meager, they nevertheless show that babies do not thrive in poor and crowded quarters, in tenements, and in alley and rear houses. The exact degree of responsibility, however, of any one of these conditions for infant deaths can not be measured by a comparison of rates. The poverty and low standards of living inevitably bound up with bad housing complicate its effects. It is fair to assume, nevertheless, that to bad housing conditions belongs some share at least in the responsibility for the high infant death rates which accompany them.

HOUSING.¹

A consideration of specified housing defects in connection with the infant mortality rates among babies subjected to them revealed a coincidence of bad housing conditions and a high infant mortality rate. The housing data collected in this study relate to the house in which the baby had lived during the greater part of its first year, and, for stillborn infants, that where the mother had lived during the greater part of her pregnancy.

Sanitary condition of baby's home.—Out of a total of 1,624 dwellings of the 1,643 babies scheduled by this investigation, 1,597 had city water and 1,500 had sewer connection for both sink and toilet. The majority of the homes which did not have city water and sewer connection proved to be located on the outskirts of the city where rural conditions prevailed, so that the absence of these facilities did not serve as an index to general bad sanitary and housing conditions.

Data gathered regarding the sanitary condition of the dwelling give further detail to the general picture of housing and sanitary conditions, although they are not presented as factors in the infant mortality rate. Of the 1,624 dwellings, 1,060 were reported good as to means of ventilation, 480 were fair, and 81 poor. The rooms were reported clean in 741 cases, medium in 671, and dirty in 203 cases. There were 1,531 dwellings where the toilet was a water-closet, and for 1,377 of these it was located in the house; 90 dwellings had wet or dry privies. From these statements it appears that the housing and sanitary conditions of a considerable proportion of the homes visited by the agents were fairly good. (See Table 58.)

¹ See further discussion of housing on p. 131 of this report.

Multiple dwellings.—Two-family and three-family homes which present conditions not greatly different from those of single dwelling houses were very common. They were built usually with but one apartment to a floor, so that each family had light and air on four sides and were found in large numbers in the more open parts of the city. The term tenement house, in the common sense of the word, should apply in Manchester to houses which contained more than one apartment to a floor, though often rows of attached houses of one or more stories were termed tenements, and they presented many features commonly associated with tenement-house conditions. A number of old three-story wooden houses of this type existed in the central portion of the city. The tendency was, however, for houses of four families or more to represent the tenement type and houses of less than four the single-family type.

There were 244 live-born babies whose homes were in single-family houses, 384 in two-family houses, and 435 in three-family houses. Thus over half the babies, 819, had homes in the two-family and three-family houses so common in the city. The dwellings of 283 live-born babies were in four-family to six-family houses, and 186 had homes in houses containing over six families.

Babies whose homes were in multiple dwellings, particularly in buildings which housed a large number of families, had a decidedly higher death rate than those whose homes were in single-family houses. The death rate for babies whose homes were in one-family houses was 86.1; and in houses containing seven or more families, 236.6. The contrasts are sufficient to indicate the disadvantage of a tenement home to babies.

But in this case, as elsewhere, housing conditions reflect economic status, so that the influence of both conditions undoubtedly enters into the rates quoted above.

Dwellings per building.	Births during selected year and infant deaths.					
	Total births.	Live births.			Stillbirths.	
		Total.	Infant deaths.		Number.	Percent. ¹
			Number.	Infant mortality rate.		
All classes.....	1,643	1,564	258	165.0	79	4.8
Dwellings:						
1.....	254	244	21	86.1	10	3.9
2.....	403	384	59	153.6	19	4.7
3.....	457	435	77	177.0	22	4.8
4 to 6.....	301	283	46	162.5	18	6.0
7 or more.....	195	186	44	236.6	9	4.0
7 to 9.....	98	90	23	.....	8	.....
10 or more.....	97	96	21	.....	1	.....
Not reported.....	33	32	11	1

¹ Not shown where base is less than 100

INFANT MORTALITY.

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TABLE 61—Continued.

Persons¹ per dwelling and nativity of mother.

Births during selected year.

According to number of rooms in dwelling.

French-Canadian mothers—Con.
Persons per dwelling—Continued.

Other foreign-born mothers

Persons per dwelling:

¹ Baby born during selected year not included in number.

TABLE 62.

Persons¹ per room and nativity of mother.

Births during selected year and infant deaths.

All mothers

Less than 1.....
1 but less than 2.....
2 but less than 3.....
3 but less than 5.....
Not reported.....

Native mothers

Less than 1.....
1 but less than 2.....
2 but less than 3.....
Not reported.....

Foreign-born mothers

Less than 1.....
1 but less than 2.....
2 but less than 3.....
3 but less than 5.....
Not reported.....

French-Canadian mothers

Less than 1.....
1 but less than 2.....
2 but less than 3.....
3 but less than 5.....
Not reported.....

Other foreign-born mothers

Less than 1.....
1 but less than 2.....
2 but less than 3.....
3 but less than 5.....
Not reported.....

¹ Baby born during selected year not included in number. ² Not shown where base is less than 100.

Room congestion
 tigation 42.5 per
 exclusive of the b
 the average was 1
 2 but under 3; and
 ber of persons per
 found more comm
 native, particular
 numbers of "boar

The infant mor
 the number of pe
 was less than 1; 17
 where the average

TABLE 61.

Persons 1 per dwelling a
 mother.

All mothers.....	
Persons per dwelling:	
1.....	
2.....	
3.....	
4.....	
5.....	
6.....	
7.....	
8.....	
9.....	
10.....	
More than 10.....	
Not reported.....	
Native mothers.....	
Persons per dwelling:	
1.....	
2.....	
3.....	
4.....	
5.....	
6.....	
7.....	
8.....	
9.....	
10.....	
More than 10.....	
Not reported.....	
Foreign-b.....	
Persons per dw	
2.....	
3.....	
4.....	
5.....	
6.....	
7.....	
8.....	
9.....	
10.....	
More than	
Not rep	

Persons

Tenure of home and nativity of mother.	Live births during selected year and infant deaths.		
	Total live births.	Infant deaths.	
		Number.	Infant mortality rate, ¹
Mothers.....	1,564	258	165.0
Owned.....	186	16	86.0
Not owned.....	1,314	226	172.0
Monthly rental:			
Under \$7.50.....	175	37	211.4
\$7.50 to \$12.49.....	703	121	172.1
\$12.50 to \$17.49.....	300	47	156.7
\$17.50 and over.....	62	6	
Free.....	6		
Boarding.....	68	15	
Not reported.....	64	16	
Foreign-born mothers.....	523	67	128.1
Owned.....	68	6	
Not owned.....	444	58	130.6
Monthly rental:			
Under \$7.50.....	49	11	
\$7.50 to \$12.49.....	217	36	165.9
\$12.50 to \$17.49.....	103	7	68.0
\$17.50 and over.....	43		
Free.....	1		
Boarding.....	31	4	
Not reported.....	11	3	
French-born mothers.....	1,041	191	183.5
Owned.....	118	10	84.7
Not owned.....	870	168	193.1
Monthly rental:			
Under \$7.50.....	126	26	206.3
\$7.50 to \$12.49.....	486	85	174.9
\$12.50 to \$17.49.....	197	40	203.0
\$17.50 and over.....	19	6	
Free.....	5		
Boarding.....	37	11	
Not reported.....	53	13	
French-Canadian mothers.....	574	129	224.7
Owned.....	71	10	
Not owned.....	494	118	238.9
Monthly rental:			
Under \$7.50.....	71	19	
\$7.50 to \$12.49.....	288	61	211.8
\$12.50 to \$17.49.....	100	24	240.0
\$17.50 and over.....	11	6	
Free.....	4		
Boarding.....	20	8	
Not reported.....	9	1	
Other foreign-born mothers.....	467	62	132.8
Owned.....	47		
Not owned.....	376	50	133.0
Monthly rental:			
Under \$7.50.....	55	7	
\$7.50 to \$12.49.....	198	24	121.2
\$12.50 to \$17.49.....	97	16	
\$17.50 and over.....	8		
Free.....	1		
Boarding.....	17	3	
Not reported.....	44	12	

¹ Not shown where base is less than 100.

Rent.—Rent furnished less reliable than in it should be considered roomers or others in of joint families as parents and in occupied one day attribute to a rent paid would be paid, while observed the rent of the impair but due to status. In a very mobile, A comparison of each group to the general conditions.

The rent classes: Less than \$17.50 where the rate among babies, 70% \$12.49, 70% in the neighborhood the infant belonged occurred homes and

Ward of residence.	Births during selected year and infant deaths.					
	Total births.	Live births.			Stillbirths.	
		Total.	Infant deaths.		Number.	Percent.
			Number.	Infant mortality rate.		
The city.....	1,643	1,564	258	165.0	79	4.8
1.....	111	107	19	177.6	4	3.6
2.....	224	216	51	236.1	8	3.6
3.....	189	179	27	150.8	10	5.3
4.....	244	235	34	144.7	9	3.7
5.....	143	141	17	120.6	2	1.4
6.....	201	184	22	119.6	17	8.5
7.....	150	141	21	148.9	9	6.0
8.....	157	150	19	126.7	7	4.5
9.....	224	211	48	227.5	13	5.8

Nationality of mother.	Births during selected year.									
	Total.	Ward of residence.								
		1	2	3	4	5	6	7	8	9
All mothers.....	1,643	111	224	189	244	143	201	150	157	224
1. born.....	548	56	68	56	41	78	82	65	47	55
2. Canadian, French.....	1,095	55	156	133	203	65	119	85	110	169
3. Canadian, except French.....	610	37	70	36	62	31	86	42	96	150
4. English, Irish, and Scotch.....	27	4	.....	4	3	3	6	2	.....	5
5. Greek and Syrian.....	170	1	68	62	24	2	10	.....	.....	3
6. German.....	115	7	5	13	28	17	10	23	4	8
7. Polish.....	72	.....	.....	.....	65	3	4	.....	.....	.....
8. Lithuanian and Lithuanian.....	30	.....	.....	.....	.....	2	16	9	.....	3
9. Other and not reported.....	24	.....	3	3	12	6	.....	.....	.....	.....
	22	.....	4	14	4	.....	.....	.....	.....	.....
	25	6	6	1	5	3	1	2	1	.....

CONCLUSIONS.

Infant mortality rate.—The infant mortality rate of 165 for the city of 1,564 live-born infants is strikingly high. Not only is it higher than the rate of 124, computed in 1910 for the general area of the United States, and higher than that of 101.8 for New York City with all its congestion and large foreign population, but it is also several times as high as the rates found in certain foreign countries.

Environment.—Bad housing and insanitary environment, in so far as they existed, were accompanied by high infant mortality rates. These conditions were confined to relatively few areas and were not generally prevalent throughout the city. They are, however, likely to become worse and more extensive in the future unless controlled by adequate restriction.

WARDS.

A comparison of infant mortality rates by neighborhoods is another method of measuring the influence of bad environment. This method, however, yielded more or less negative results in Manchester, for the reason that no practicable method was found of comparing good and bad districts.

Births and deaths were recorded by wards, but the ward divisions in Manchester had only political significance; they did not correspond to any division of the city into sections according to the character of the housing, sanitation, or population. The majority of the wards radiated from the center of the city and presented every variety of neighborhood within their boundaries. Such a lack of distinctive character in the wards made it difficult to interpret the infant mortality rate each showed.

The two wards exhibiting the lowest infant mortality rates were wards 5 and 6, with rates of 120.6 and 119.6, respectively, were the wards containing the greatest proportion of people living under suburban and semirural conditions. No crowded or congested areas were found within the boundaries of either.

The highest infant death rates were found in wards 2 and 9. In the former there were 51 infant deaths, which made a rate of 227.5, and in the latter ward 48 deaths, a rate of 227.5. Both of these wards had sections varying widely in character, but they also presented conditions which throw some light upon the large number of infant deaths occurring in them. Ward 2 was one of the radiating wards and at its inner end exhibited some of the worst living conditions in the city. Over two-thirds of the mothers here were foreign born, the majority being French Canadians and Poles. Ward 9 was on the west side and quite closely built up, with some congested districts. The housing on the whole, however, was much superior to the worst sections in the congested central portion east of Elm Street. A large proportion of the inhabitants of this ward were "mill" people, and over two-thirds French Canadians.

The other wards of the city had infant mortality rates which fell well within these extremes and which bore no particular relation to neighborhood conditions. A somewhat peculiar contrast appeared between the rates revealed for ward 1 and for ward 4. The former, which contained the best residence district of the city, had an infant mortality rate of 177.6, while the latter, which was the most congested ward in the city, had a rate of only 144.7. Such results may be wholly accidental, of course, since the numbers involved are small, or they may be explicable upon the basis of facts not disclosed by this investigation. In any case, no satisfactory comparison of neighborhoods and rates can be made on the basis of ward divisions because of the varied conditions found within each ward.

PART II. CIVIC ACTIVITIES AND CONDITIONS.

ORGANIZATION OF INFANT-WELFARE WORK.

During the period covered by this study organized infant-welfare work in Manchester was in charge of private philanthropy. One organization, the Infant Aid Association, gave its exclusive attention to this work. Its activities were confined to the support during July and August of milk stations, where pure milk was distributed at cost or less to mothers otherwise unable to provide it for their babies. The milk was modified according to the baby's requirements and the mothers were given instruction in the care and feeding of the baby. The association began its work in 1912 with the opening of one milk station. In 1914 the number of milk stations was increased to three, with a staff of four nurses giving full time and a number of physicians giving part time. A total of 266 babies were cared for during the two months. In addition to the instruction of mothers at the stations through mothers' meetings and baby clinics, the mothers and babies were visited in their homes.

The District Nursing Association also has interested itself in infant welfare, referring cases to the Infant Aid Association during the months when the milk stations were open and taking over such cases as needed attention after the milk stations had closed. In 1914 they maintained a special baby nurse who devoted all her time to work with babies. There were in her charge during the year 198 babies. The association also gave mothers who were pregnant advice and attention when needed.

The larger of the two textile-manufacturing establishments maintained visiting nurses for the benefit of the families of its employees. As part of their work during 1914 these nurses made visits to infants and attended maternity cases.

The city did not engage directly in infant-welfare work in any form, but in 1913 it appropriated the sum of \$300 toward the work of the District Nursing Association, and it also made similar appropriations to various institutions for the care of dependent infants and children. The department of health had charge of milk inspection and medical inspection of school children; it did not, however, at that time engage in any activities, educational or otherwise, which had as their special object the promotion of infant health and hygiene.

Since this study was made the infant-welfare activities of Manchester have been considerably broadened; the Infant Aid Associa-

small annual appropriation from the city. These hospitals all did general work and accepted obstetrical cases. It was not a common practice, however, among the mothers interviewed to go to the hospital for confinement.

Private relief.—Homes for the care of various classes of dependent children and for the aged and infirm were the most numerous of all philanthropic institutions. Altogether there were 20 such homes in Manchester, of which 8 were for children, 5 for the aged, and the 7 remaining for a variety of classes. The children's homes are of most interest in connection with this report. One of these was an infant asylum, which took only children under 4 years of age, and in one other small children and babies were taken care of by the day while the mothers went to work. All were private institutions, but, inasmuch as there was no county or city children's home, children who were public charges were boarded in these homes by the county and city. Parents also sometimes placed their children in them and paid either wholly or in part the cost of their maintenance. The city contributed a small annual appropriation toward the support of the majority of these homes, and the remainder of their support came from private charity.

The New Hampshire Children's Aid and Protective Society, with headquarters at Manchester, was interested in the protection of children, including infants, from abuse and neglect. A part of its work had been the investigation of infant boarding houses, or private homes which took one or more infants to board, in order to discover and abolish unlicensed places and places unfit to receive babies.

Private charitable relief in Manchester was left largely to unorganized effort. One society maintained by the various Protestant churches was engaged primarily in giving general material relief to the poor in their homes. Other societies and institutions gave some material relief incidentally in connection with other lines of philanthropic activity.

The larger factories did a considerable amount of welfare work for the promotion of the health and general well-being of their employees. This work provided for educational and recreational facilities, medical attention both for employees and for members of their families, assistance in building homes, and other activities.

Public relief.—Public relief of the poor in Manchester was administered by both the city and the county. The city helped residents, that is, persons who had established a settlement; and the county, nonresidents. The requirements for obtaining a settlement were so difficult to meet, however, that the amount of relief given by the county to inhabitants of Manchester exceeded that given by the city. In 1913 the county aided Manchester families representing 1,341 persons, and disbursed \$14,329.84 for the relief of persons in their

homes. This was exclusive of \$2,176.15 spent for the dependent soldiers. In addition the county also spent a considerable sum on indoor relief, for the maintenance of Manchester prisoners at the county farm, and for the board of dependent children outside, estimated to be \$38,103.05.¹ The amounts by the city were \$14,825.08 on outdoor relief, \$2,706.01 for the support of dependents in homes, and \$391.25 for the relief of dependent soldiers.

In addition, as stated previously, the city contributed in support of various private philanthropic institutions. Its municipal appropriation amounted to \$5,100, divided among various organizations.

The total amount, then, expended by county and city on indoor and outdoor relief in 1913 was \$69,964.01. This was in addition to aid to soldiers and appropriations to private institutions. These included the amount was \$77,631.41.

This represents a considerable sum spent for public relief in a city of 74,000 population, but in the absence of information concerning the total number of persons and of the total and the amounts expended for similar purposes by private institutions it is not possible to draw conclusions with regard to the extent of poverty in the city which this expenditure may indicate.

There were 32 babies included in this investigation who were on the county or city records as receiving outdoor relief. On account of the difficulty of identifying names, however, there is an understatement of the total number.

Public care and protection of infants.—As has already been stated there were no public institutions for the care of infants in Manchester. Dependent children under 3 years of age were placed in the county almshouse. The published records of the almshouse for 1913 showed that 30 babies under 1 year of age were on the county farm in 1913.² The private infant hospital at Manchester also admitted 20 babies under 1 year of age during 1913. By this investigation.

Private individuals also took infants under 3 years of age. This requires that when the number received by private individuals is added to obtain from the State board of charities the total number of babies in boarding house for infants.³ The amount of money expended by the local board of health, but not by the State board of charities. In Manchester during 1913 the investigation there were two infants in the almshouse.

¹ Estimate based on the percentage of outdoor relief given to the total county outdoor relief.

² Report of the County Commissioners for 1913.

³ Session Laws of 1911, ch. 211, § 10.

EDUCATION.

The educational situation in Manchester reflected to some extent the tendency pointed out in earlier pages for the French Canadians and also the Greeks to retain their own community life. The schools were almost equally divided between public and parochial, 27 of the former and 24 of the latter having enrollments of 6,679 and 6,688 pupils, respectively. One of the parochial schools was of the Greek Church and the others Roman Catholic. The standards of the Greek school did not meet the public educational requirements, however, and it therefore held its sessions only after regular school hours, and attendance in a public school was required of its pupils. The remaining parochial schools were all officially approved.

A number of these schools were termed, locally, "French schools"—that is, they were conducted partly in the French language. There was also one "Polish school." All these schools conformed to the law in teaching English part time, but it appeared to be regarded as a foreign language by some of the children in the French schools. This explanation was given by some of the native-born "French" mothers for their inability to speak English. Agents frequently found that school children whom they addressed on the street to inquire for direction were unable to understand English. In the predominantly French section the language of the home, the street, and the shop was French.

PUBLIC HEALTH AND SANITATION.

Administration.—The board of health is the city department primarily concerned with the problem of public health and sanitation, but at the time of this study the scope of its work was considerably limited by inadequate financial support. The board had no full-time executive health officer, and the amount allowed for salaries was quite insufficient to secure the expert service which such a board requires. The expenditures for 1913, exclusive of the cost of maintenance of the isolation and smallpox hospitals, amounted to only \$11,282.56. Of this, \$2,911.05 was expended for medical inspection in the schools, leaving only \$8,371.51 to cover the cost of sanitary inspection, milk and food inspection, maintenance of laboratory, control of contagious diseases, and payment of salaries and office expenses. Three members of the board of health gave part time and served at a nominal salary. One of the members was a physician, but no physician or trained bacteriologist giving full time regularly was in the board's employ. All the executive and administrative business was transacted at the board meetings which were held usually once a week, though extra meetings were called if the occasion demanded. In 1913 the number of meetings held was 55. Four sanitary inspectors acted as the agents of the board of health

and carried out its orders. With a force and budget so limited the work of this department was necessarily handicapped.

Recently, however, there has been a radical change in the city's policy toward health and sanitation. Since March, 1916, Manchester has had a full-time health officer who is reorganizing the department according to modern standards.

Other city departments concerned with the maintenance of public sanitation are the board of public works, the board of water commissioners, the department of buildings, and the police department. The board of public works has charge of the paving and cleaning of streets, the construction and maintenance of sewers, and the scavenger service. The water commissioners have charge of the city water works. The department of buildings administers the building code which lays down regulations for the construction and repair of buildings. The police department cooperates with the board of health in the abatement of nuisances and in maintaining cleanliness of back alleys and back yards.

Milk supply.—The city consumed daily about 22,000 quarts of milk and 900 quarts of cream, coming from 850 farms.¹ Most of this supply the milk inspector reported to be produced within 20 miles of the city and to be from 12 to 18 hours old when delivered to the consumer. All milk was required to be bottled at the dairy or milk station, and to be retailed only in closed containers. All persons selling milk in the city were required to be licensed and all dealers who purchased from others milk to sell in the city to file with the board of health a list of the names and addresses of all persons or firms from whom they collected their milk. All farms producing milk consumed in Manchester, as well as all city milk plants—that is, depots where milk was shipped and bottled for distribution—were subject to inspection by the board of health.

The work of milk inspection at the time of this inquiry included visiting and scoring the various farms and the city milk plants, the collection and laboratory examination of samples of milk, and the notification and prosecution of violations. Two sanitary inspectors of the board of health gave part time to this work. The chief milk inspector was plumbing inspector also, and in addition inspected and scored barber shops. Obviously this force was too small to do satisfactory work. It was not possible to visit the majority of the farms oftener than once a year, and farms lying at too great a distance could not be visited at all. In 1913-14 inspections were made about 20 miles north, 35 miles east, 12 miles south, and 9 miles west.

As stated above, 850 different farms were reported to be supplying the city with milk. As only 91 licenses were granted in 1913

¹ Private report made to Dairy Division, U. S. Department of Agriculture, by board of health, Manchester, Feb. 4, 1914.

to milkmen, it is evident that the city received the bulk of its milk supply from a large number of small producers scattered through the country who sold to middlemen. Such a supply is the most difficult to safeguard. The number of farms visited and scored in 1913 was 420, not quite half of the total number reported to be sending milk to the city.

The official Dairy Instructors' Association score card was used in the work of inspection and the average score for the 420 farms was 46.38 out of a possible 100 points. Regarding the use and significance of the score card, a bulletin of the United States Department of Agriculture says:¹

The score card is not a set of peremptory orders, but a system of giving credit for good conditions and marking down for bad ones. It does not ask or expect a man to be perfect, but rates him as it finds his equipment and methods. A dairy in the seventies is usually in acceptable condition.

The chief requirements as to the quality of milk which may be sold in Manchester, contained in the State law and in the local milk regulations, state that milk shall contain at least 12 per cent total solids, and no adulterants or preservatives; that it shall not be produced from diseased cows, nor under insanitary conditions, nor contain more than 500,000 bacteria per cubic centimeter; it shall be maintained at a temperature of not more than 55° F., and must be retailed in sealed receptacles.² No standard was required for dairy scores, as the board of health considered that the best results would be accomplished by educating the dairymen and enlisting their voluntary interest in proper methods of production. The scores of the various milkmen were kept on file at the board of health office, and might be consulted by private citizens upon request.

Besides dairy inspection an important supplementary means of controlling the quality of the milk supply, and the only means of enforcing bacteriological standards, is the frequent collection and examination of samples for adulterants and particularly for bacteria. The former director of the United States Hygienic Laboratory, Dr. M. J. Rosenau, has the following to say as to the value of bacteriologic counts:³

The health officer who has the advantage of bacteriologic assistance knows that the milk of dairies containing excessive numbers of bacteria is dirty, old, or warm.

With a bacteriologic count as a guide it is comparatively easy to determine the cause of the trouble and institute proper means to correct it. The enumeration of bacteria in milk is, therefore, one of the cheapest and readiest methods at the disposal of the health officers to determine the general sanitary quality of the market milk supply. The laboratory results serve not only as a guide to direct the efforts of the health officer,

¹ "The score card system of dairy inspection." George M. Whittaker, circular 199, revised, Bureau of Animal Industry, U. S. Department of Agriculture, p. 10.

² Sanitary Milk Rules, issued by board of health of city of Manchester.

³ Milk and its Relation to the Public Health, U. S. Hygienic Laboratory, bulletin 56, pp. 436 and 437.

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the period which this investigation covers. The tubercular test was enforced for inspected milk only. About 10 per cent of the whole supply was pasteurized. The health officer estimates that now about 50 per cent is pasteurized.

Two dairies supplied inspected milk to Manchester. They had a total of about 50 or 60 cows, and in 1913 their scores were 77.6 and 83.2, respectively; in 1914 they scored 81 and 86.8, respectively. The city milk plants scored an average of 71.1.

The importance of a pure milk supply to the health and well-being of babies is well recognized. The facts recited in the foregoing description make it apparent that the milk supply in Manchester was not adequately safeguarded during the period covered by this investigation. The force of inspectors was inadequate and generally lacking in scientific training. Inspections of dairies were too infrequent to maintain standards of production, and the average of the scores which were obtained was considerably below the rating which indicates an acceptable condition. The use of the bacteriologic count would have been of greater value if more samples had been examined.

Water supply.—The source of Manchester's water supply is Lake Massebesic, a lake of about 2,500 acres, located to the east of the city and partly within its boundaries. The lake is protected from contamination by city and State regulations as to the use which can be made of its banks. The city owned 82 per cent of the shore. The lake had approximately 40 miles of watershed, about half of which was wooded and half cleared. There was no filtration system or settling basin, but the water was pumped from the lake directly into a reservoir of 15,000,000 gallons capacity, from which it flowed directly into the distributing mains. The local superintendent of the waterworks estimated that about 90 per cent of the population of Manchester were consumers of this water. The service was extensive and accessible to all parts of the city except the outlying districts.¹

Streets.—Manchester, because of the large rural area within the city limits, had a very considerable street mileage—203.6. Of this, however, 72.7 miles were outlying country roads. Paved streets, including "back streets" and "lanes," comprised only 8.6 miles. The pavements used were chiefly tar, concrete, and granite blocks. The back streets and lanes are not included in the total street mileage given above, and their length is not given in the city reports. There are in the city, however, a number of these narrow thoroughfares running between two main streets, called lanes or back streets, which, though they had some houses fronting on them, were practically alleys.

¹ The reports of the State board of health for 1911-12 and 1913-14 give an analysis of this water supply. The former report states that about 99 per cent of the population are consumers of the city water. No opinion as to the quality of the water supply is included in the report. Some index to the quality, however, may be afforded by the fact that there were only five cases of typhoid fever reported in Manchester for 1913.

The usual width of street in Manchester is 50 feet. Elm Street, the main business street, which runs the length of the city, is 100 feet wide. A few streets are 30 and 40 feet, while the lanes—with the exception of Martin Lane, which is only 17 feet—are 20 feet, the same width as the alleys. Portions only of the lanes were paved, and most of them had no sidewalks. Sidewalks, however, were found along all the principal streets; their total length was approximately 200 miles.

The streets in Manchester were kept in a fair condition. Most of the paved streets were cleaned regularly. Some of the unpaved streets were macadamized. Where that was not the case the streets were apt to be very dusty, because of the loose, sandy soil. About 72 miles of streets were regularly sprinkled between the months of April and November. Some oiling was done also. The chief criticism which the agents encountered with regard to the condition of the streets referred to the "lanes." Some of these were found dirty and littered with trash. Also, in the more outlying districts, dusty streets caused complaint in dry weather.

Sewerage.—The sewer service in Manchester reaches a large proportion of the population. There was in 1913 a total of 93.5 miles of sewer as compared with 203.6 miles of streets, but the fact that so much of the city is rural territory makes this contrast appear more unfavorable than the situation warrants. All the built-up portion of the city had public sewer service, with the exception of a small section near the mills occupied by "company houses." This portion of the city was built and maintained by the mill corporation and was served in part by private sewers. It contained between six and seven hundred dwellings, all of which have now been connected with the sewer.

For the rest of the city the number of house connections with the sewer on record for 1913 was 7,785. The United States census reports the number of dwellings for Manchester in 1910 to have been 8,694, and the number of house connections recorded for that year was 6,884, or 79.2 per cent of the total number of dwellings. Among the corporation's houses were probably several hundred connections. A city ordinance requires that every house within 100 feet of public sewer shall be connected.¹

All sewage flows directly into the river, and the factory waste empty into the factory canals and thence into the river. No method of purification was employed. In spite of the fact that the sewer exits are into the Merrimack River where it flows through the center of the city, no nuisance was observable from this method of sewage disposal, due to the fact, no doubt, that the mills surround the river in the heart of the city and there are no dwelling houses near its banks.

¹ Public Statutes, ch. 108, sec. 8, as amended by Laws of 1907, ch. 106, sec. 1.

Garbage and refuse collection.—Garbage collection in 1913 was by private scavengers, licensed by the board of public works, which was charged with the duty of regulating and providing for this service. Collections were required to be made twice a week, and the garbage must be kept by the householder in a covered receptacle apart from ashes and rubbish. Part of the garbage was collected and sold to farmers; part was collected by the farmers themselves for use in feeding their hogs. No complaint was made by the families visited of the service rendered by this system. In the congested sections the agents encountered some cases where garbage and rubbish created a nuisance in yards and alleys, but for the city as a whole the conditions observed were fair. A regulation prohibiting the placing of receptacles in highways has gone far toward remedying these conditions. The board of health in its annual report for 1913 makes the following statements with reference to the scavenger service:¹

Eighty-nine complaints were made against the scavenger service; in each case the proper parties were notified and relief afforded.

Thirty-two persons were found throwing garbage in the back streets and were warned against the practice.

Private swill collectors have been warned 62 times to be neater in their work.

The disposal of rubbish was less satisfactory than that of garbage. The city collected and hauled the rubbish, including not only ashes but rubbish of all sorts—tin cans, crockery, mattresses, paper, etc.—to various dumps located on vacant ground within the city. There were 17 such dumps in use in 1913, and a total of 13,432½ loads, or 71,585.53 cubic yards, of rubbish were collected and deposited upon them. Among the largest was the so-called Putman Street dump, located in a residence district. This dump was not only unsightly and a nuisance because of the odors arising from it, but had more or less organic material mixed with the rubbish which was deposited here. Furthermore, it was a breeding place for germs, flies, and rats and mice. Such articles as old mattresses deposited upon the dumps may readily carry disease directly. The Putman Street dump, at the time this investigation was being carried on, was frequented by people who picked up rags and junk from it. Children also played there. Other dumps were less objectionable. The board of health reports for 1913 that "the dumps have been inspected 65 times; found insanitary 18 times."

The city authorities made an effort to keep the dumps in as sanitary a condition as possible by burning the combustible material they contained and by covering them with earth, but such a method of rubbish disposal is necessarily unsatisfactory. Since the period to which this report refers, dumping has been discontinued at the Putman

¹ Annual Report of the Board of Health, Manchester, 1913, p. 31.

Street dump. The city still has failed, however, to provide for a incineration plant in accordance with present-day standards sanitary engineering, a step long urged by the board of health and the board of public works.

With the growth of population in Manchester and increase in density the present relatively primitive methods of sewage and garbage disposal are likely to result in a serious menace to public health. That these methods are not more obnoxious at present is due in part to the size of the city, the distribution of the population over a broad area, and the fact that the water of the Merrimack is used by this city only for manufacturing purposes.

Housing.—The mills lining the banks of the Merrimack lie in the heart of the city, and spreading outward from them the population becomes less dense. The river and the mills divide the city into two distinct parts, called locally East and West Manchester. East Manchester is the larger and contains the main business section, with Elm Street, running parallel to the river, as its center. West Manchester also has its business street, Main Street, running parallel to the river and bearing the same relation to the west side that Elm Street does to the east. These two parallel streets bound the mill territory, though the bulk of the mills lie on the east side of the river, and it would be more nearly correct, perhaps, to say that the density of the population decreases as one moves outward from these two streets.

Between Elm Street and the mills, on the east side of the river, lies a section known as the "Corporation." This was built up largely with "company houses," put up many years ago to provide for the employees of the cotton mills in the early days of the city's growth. The majority of these houses were found in two-story brick rows, with small yards and sheds to the rear. Some were built in rows facing each other upon a common yard and had grass plots in front. Others fronted directly upon the street. There were also some three-tenement and four-tenement "blocks."¹ The houses were for the most part substantially built and a number of the streets were lined with shade trees so that they did not present the barren, dilapidated aspect of many "company rows." Conditions varied somewhat, however. At the time of this investigation there were also a number of old wooden tenements, with yard privies, which presented objectionable conditions. These frame tenements have been removed since and within the past two years eight new five-family brick blocks have been erected within the "Corporation." All yard privies also have been removed from corporation premises. Elsewhere most of the houses encountered were connected with sewers, though in a number of cases the water-closet was in a shed to the rear of the house and the tenan

¹ A tenement building is termed, locally, a "block"; this may apply to one building proper or to a row of attached houses.

complained of its freezing up in winter and getting out of repair. The sewer service, street cleaning, and scavenger service in this district are all provided by the mill corporation. All these houses but two blocks belonged to one company, which also owned what would equal about one city block of houses across the river. In all, this company maintained 629 tenements including 31 boarding houses. The wooden tenements, in reality rows of two-and-a-half-story houses, comprised 11 so-called "blocks" and 60 tenements or dwellings.

The worst housing conditions and the most congested district in the city were found east of Elm Street, in the district extending about 15 city blocks along Elm Street, north and south, and about three blocks east, now chiefly included in the present ward 5. It contained portions of wards 2, 3, and 4, so that it was not possible to obtain the population per acre, but there was a considerable degree of lot crowding within this area, and as most of the buildings, with the exception of those along Elm Street, were wooden, the fire menace was serious. In this district were sixteen 4-story wooden tenements, three of which were rear.¹ This neighborhood contained a number of houses fronting on the so-called "lanes," which in reality were alleys, being only 20 feet wide and presenting alley conditions. There were 40 tenements and 43 houses, chiefly wooden and including rear houses, fronting on these lanes. In a number of cases, besides, the buildings ran through from street to alley, occupying practically the entire lot, and several almost solid city half blocks were found, particularly along Elm Street. Many of the wooden houses were old and in bad repair. Toilets, many of which are now in the tenements, were usually in the basements, one for several families, and often the public also had access. Under such conditions it was almost impossible to maintain them in a fit condition. In some cases the pipes had rusted and were so clogged that it was nearly impossible to flush the closets. In the old and dilapidated houses sanitary conditions generally were bad. Also the danger of fire was great in these places, especially as such houses were heated by stoves and the rooms and public halls frequently lighted by lamps.

Along Elm Street a large proportion of the buildings were brick and on the lower floors were used for the most part for business purposes, and above for tenements. Shops and stores claimed a portion of the other streets also, and a considerable number of public buildings were located in the district. One commendable feature which tended to relieve the general congestion of this section was the existence of four or five open squares or commons.

A small section on the west side of the river, in the ninth ward, now the extreme eastern sections of wards 12 and 13, contained

¹ Data as to numbers of alley houses and tenements obtained from fire insurance map of Manchester, published by Sanborn Map Co.

conditions as bad as described above, but much more limited in extent. This was a triangle containing six city blocks located between the mills and Main Street. At the time of the investigation all but two of the buildings in this area were wooden, and it contained seven 4-story wooden tenements, two of which were rear houses. There were four rear tenements and one rear house. The blocks were bisected by two small lanes, one of 17 feet and one of 20 feet, on which these rear dwellings were found. The occupants were largely French Canadians. Along Main Street in the central portion of the west side were also some bad housing conditions and instances of lot crowding. Some old dilapidated buildings and tenements were found here and a few rear houses, but conditions were not comparable with those just described for the section just east of Elm Street.

Outside of these three areas only isolated cases of bad housing were found. Most of the houses in Manchester were frame dwellings of two and three stories and with adequate lot area. Wooden tenement and flat buildings were scattered all over the city, but the type which was being erected most frequently in all but the best residence portion of the city was the two-family and three-family house. It was cheaper to build than the attached houses, because the fire regulations required that every party wall, or wall between two apartments, must be of fireproof material, and this added to the cost of construction. The three-family house particularly was being built in large numbers with one family to a floor. This style of building allows a more intensive use of the lot and when new is attractive and desirable in that it permits each family to have light and air on four sides. This condition holds, however, only so long as the adjoining lots are not built upon, and such houses tend toward lot crowding. They are also dangerous in case of fire, as the interior stairways running straight up from first floor to roof act as chimneys. Another common practice in Manchester was to build two houses upon one lot by placing one house to the rear and side so that a portion of the house had front access on the street. It might or might not be attached to the one in front. Such houses for the most part had adequate light and air and were not counted as rear houses in this report, but houses so placed soon become objectionable and are likely to be shut in later.

The chief evils in the housing situation in Manchester have to do with maintenance. A new building code, passed in 1911, provided against the multiplication of some of the present evils in the construction of new houses, but there is no provision for the alteration of old houses, other than that buildings hereafter remodeled to an extent exceeding the cost of 50 per cent of the original building cost shall be made to conform to the requirements of the code. It also provided that no more frame buildings shall be erected within the fire limits, and if any building shall be damaged by fire to a greater extent than 50 per cent of its value it must be torn down. The new requirements ma

struction more expensive, with the result that the old property has a higher rate on the investment than new buildings could be made to do. The result is that the tearing down of old buildings is delayed, and, since there are no requirements as to the minor alterations or repairs, the condition in which they are maintained depends on the interest and disposition of the landlord. In some cases old wooden property has been left standing on the front of the lot and a new brick tenement has been built on the rear.

While tenement-house inspection was not organized, the board of health inspected for sanitary conditions upon complaint. It might order the premises cleaned or water-closets and cesspools cleaned and repaired, or it might order water-closets installed. As before stated, the law requires that all houses within 100 feet of a public sewer be connected, and that a water-closet for every 15 persons be maintained. The board of health also inspected plumbing fixtures when they were installed, to see that they conformed to the plumbing regulations. In 1913, the board stated in its report, 1,002 tenements, vaults and privies, and 50 cesspools were inspected. It reported 1,002 tenements cleaned, 492 water-closets cleaned or repaired, 21 cesspools and 35 "filthy hallways and roofs" ordered cleaned, and 15 vaults and privies ordered cleaned or repaired. In addition, inspections were made of yards and alleys, cellars, outbuildings, and barns. The building code provides that for new houses no room shall be built without windows opening either upon a court, yard, or the street, and that not more than 70 per cent of an inside lot or 90 per cent of a corner lot shall be occupied. Every apartment must have a water-closet with adequate means of ventilation. Also the window floor area is prescribed for each room. Inner courts must be 12 feet in width and outer courts 8 feet for buildings three stories in height. This width must be increased with the increase in the height of the building over three stories, or may be decreased with each story less than three. But a court whose outer side is on the lot line need measure only 4 feet in width for a building three stories in height. Furthermore, the code does not forbid the erection of rear houses nor their encroachments upon the lot by other buildings, on the back or the front, so that the total percentage of the lot which can be occupied may be considerably in excess of 70.

The housing situation in Manchester may be briefly summarized: The city covers a broad area and a large proportion of the population lives in the open parts of the city. Near the center, however, in the areas verging on the business and mill sections, housing conditions were seriously bad. Lot congestion, dilapidated wooden tenements, rear alley houses, and dark, insanitary dwellings prevailed. Tenement-house inspection was not systematic but was made upon complaint and chiefly for nuisances.

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PLATE I.—TENEMENT HOUSES IN THE FOURTH WARD, OUT TOWARD VALLEY STREET. MODERN PLUMBING, TOILET ON EVERY FLOOR, ALL SIDES EXPOSED TO LIGHT AND AIR. TYPE OF TENEMENT HOUSE BECOMING MORE COMMON IN MANCHESTER.



PLATE II.—REAR OF AN OLD HOUSE OCCUPIED BY TWO FAMILIES. BOTH USE SAME TOILET IN CELLAR.



PLATE III.—TWO TOILETS IN BASEMENT SERVE THE FOUR FAMILIES LIVING HERE.



PLATE IV.—HOUSE SHOWN ABOVE AND ANOTHER LARGE TENEMENT HOUSE SEPARATED FROM IT ONLY BY A NARROW PASSAGEWAY.



PLATE V.—FOUR-FAMILY HOUSE, CONTAINING FOUR DARK BEDROOMS,
TOILETS IN YARD,



PLATE VI.—REAR VIEW OF SOME THREE-STORY TENEMENT HOUSES.



TENT HOUSES.



SCENES FROM THE TENTS.





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